

AND UNUSUAL WEATHER PHENOMENA WITH LATE REPORTS AND CORRECTIONS



COVER:

The second strong Arctic front in less than two weeks moved through Washington state. The combination of high tides and strong northerly winds behind the front caused substantial damage along exposed waterfront areas. Alki Beach, shown here, experienced peak gust winds of 58 mph while winds in other areas gusted as high as 78 mph. *Photo courtesy: Tom Reese*, <u>Seattle Times</u>, Seattle, WA.

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STORM DATA

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National Climatic Data Center Editor: Roger W. Tanner Associate Editor: Vince Miller

Publication Staff: Lanny Dimmick, Jay Hollifield, Mary Ann Byrd, and Sara Lackey

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STORM DATA contains all confirmed information on storms available to our staff at the time of publication. However, due to difficulties inherent in the collection of this type of data, it is not all-inclusive. Late reports and corrections are printed in each edition.

Maps of the National Weather Service Forecast Zones which are used in the Storm Data and Unusual Weather Phenomena section will be printed in all editions.

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National Climatic Data Center Federal Building Asheville, NC 28801-2696 (704) 259-0682 or (704) CLIMATE

The editors of STORM DATA solicit your help in acquiring photographs (prints or slides; black and white, or color), maps, clippings, etc. of significant or unusual weather events (past or present). These could be for use in the "Outstanding Storms of the Month" or "Et Cetera" sections of STORM DATA. We request our subscribers or other interested persons to mail such items to:

Mr. Vince Miller 1464 Wood Thrush Way Marietta, GA 30062

Any such items received by the editors will be for use in STORM DATA only. Any other use will be with the permission of the owner of said items. Material's submitted will be returned if requested in the original submission.

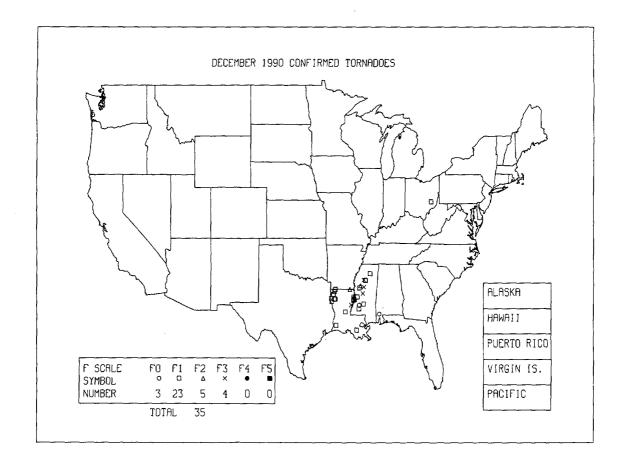
"I certify that this is an official publication of the National Oceanic and Atmospheric Administration and is compiled from information received at the National Climatic Data Center, Asheville, North Carolina 28801."

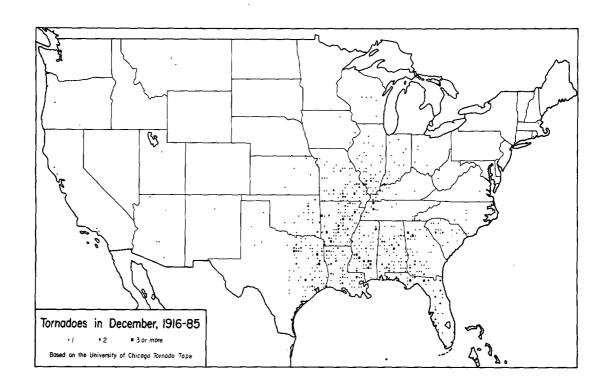
Director

National Climatic Data Center

_d D Woden

OUTSTANDING STORMS OF THE MONTH





1. PRECIPITATION AND TEMPERATURE ANOMALIES - DECEMBER 1990

Table 1 shows the December 1990 temperature and precipitation rankings for December 1990 for the nine climatically homogeneous regions shown in Fig. 1.

Heavy rains occurred from the lower Mississippi Valley to southern New England and heavy snows fell in the Rockies, upper midwest, and Great Thunderstorms Lakes region. spawned several tornadoes Alabama, Louisiana, Arkansas, Mississippi, and Florida. wettest December on record was experienced in the Central Region and severe flooding inundated the Ohio, Tennessee, and Mississippi Valleys. Hawaii and south-central Alaska also experienced well above normal precipitation, but normal temperatures. In contrast, long-term dry conditions continued in the West

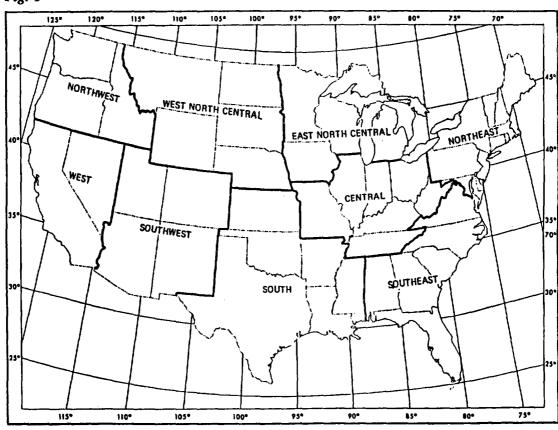
TABLE 1. TEMPERATURE AND PRECIPITATION RANKINGS FOR DECEMBER 1990, BASED ON THE PERIOD 1895-1990. 1 = DRIEST/COLDEST, 96 = WETTEST/HOTTEST.

REGION	PRECIPITATION	<u>TEMPERATURE</u>
Northeast	92	92
East North Central	82	40
Central	96	65
Southeast	34	88
West North Central	49	10
South	49	33
Southwest	48	5
Northwest	26	1
West	14	1
National	63	18

From National Climatic Data Center

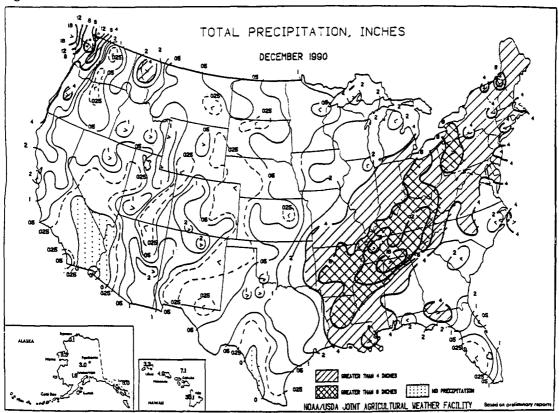
and Southeast. The last half of December brought Arctic air over the western two-thirds of the country dropping temperatures to well below zero and breaking or tying over 250 daily record lows. Record highs were reported from Texas to Massachusetts.

Fig. 1



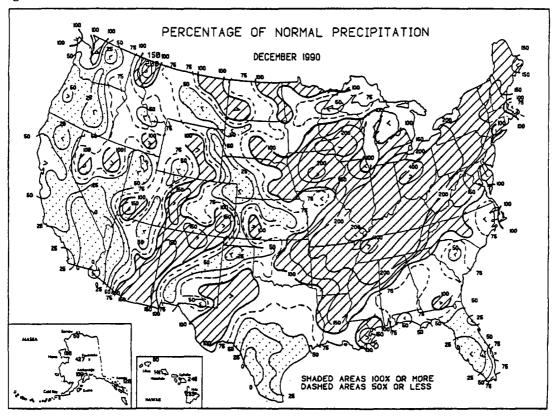
From National Climatic Data Center

Fig. 2



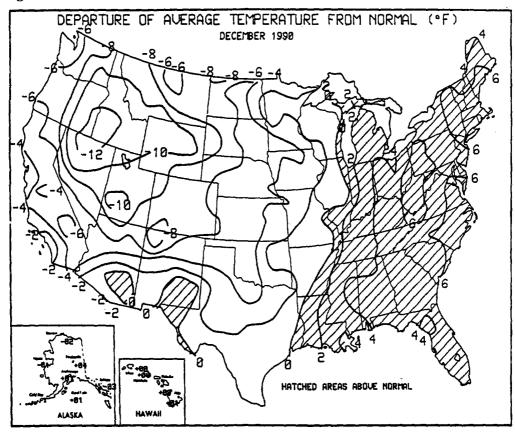
Reprinted from Weekly Weather and Crop Bulletin - January 8, 1991

Fig. 3



Reprinted from Weekly Climate Bulletin - January 5, 1991

Fig. 4



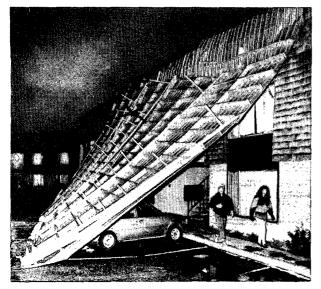
Reprinted from Weekly Climate Bulletin - January 5, 1991

2. HIGH WINDS IN NORTHWESTERN U.S. - DECEMBER 3-4

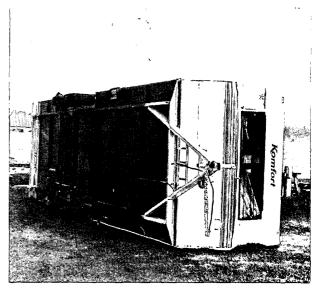
High winds associated with a fast-moving cold front caused damage in the Northwest on December 3rd and 4th. Wind gusts of 50 to 60 mph were recorded over most of the five-state area including Washington, Oregon, Idaho, Montana, and Wyoming. Stronger wind gusts to 70 mph were reported at Tatoosh Island, WA during the early morning of the 4th. Livingston, MT reported wind gusts reaching 80 mph.

Uprooted trees falling on power lines resulted in

loss of power for several thousand residents. One building was destroyed in Ferndale, WA; an outbuilding near Valier, MT was blown over. Trees and downed power lines blocked roads in northern Idaho. The unused tower portion of the Flight Service building at the Astoria, OR airport was blown over by a 64 mph wind gust. Several buildings in northwestern Oregon sustained roof damage. A trucker in northern Idaho was injured when his vehicle was overturned by a wind gust.



Wind gusting to 59 mph tore the roof off an apartment building onto a car in La Grande, OR. *Photo credit: Phil Bullock, Observer, La Grande, OR.*



A 26-foot RV trailer at Paradise Cove Resort near Wheeler, OR was blown over and pushed across two trailer spaces by high winds. *Photo credit: Virginia Grail, Headlight Herald, Tillamook, OR.*

3. SEVERE WEATHER IN THE LOWER MISSISSIPPI VALLEY-DECEMBER 20-22

Severe thunderstorms developing along and ahead of an Arctic cold front produced 18 tornadoes in Louisiana and 12 tornadoes in Mississippi December 20th through 22nd. The table below indicates the intensity of these tornadoes according to the damage-based Fujita Tornado Scale (F-scale).

<u>State</u>	<u>Date</u>	<u>F0</u>	<u>F1</u>	<u>F2</u>	<u>F3</u>	No. Injuries	No. Deaths
LA	20		1				
	21		13	3	1	7	
MS	20	1					
	21		5	1	3	18	2
	22		2			1	

Fortunately, most of the tornadoes that occurred in Louisiana cut a path through forested areas, limiting much of the damage to trees. However, an F1 tornado destroyed a barn 15 miles southwest of Shreveport and car windows were blown out near Bossier City. A mobile home was destroyed, the second floor was ripped from a house, and 20 other houses suffered slight damage by an F1 tornado in Calcasieu Parish. Thomastown experienced a strong (F2) tornado that destroyed three homes and damaged several other buildings. Three persons were injured in Thomastown. Another F2 tornado touched down near Tallulah and ripped a roof off a house before moving northeasterly and destroying a home just north of Thomastown. Four occupants of this house were treated for mostly minor injuries. The one F3



Joe Vercher, Jr. and son, Joey, look over remains of their mobile home near Saline Lake at Deville, LA (Rapides Parish). The mobile home was destroyed by a tornado which touched down on December 21st. No one was in the home at the time. It was being used for camping. Reprinted with permission of the Town Talk, Alexandria, LA (Photographer: Judy Meeks).

tornado (see list on page 8) that occurred in Louisiana touched down in Tensas Parish near the Mississippi River and cut a 300-yard-wide swath for 18 miles through a heavily-forested area. Several hunting camps were destroyed and a considerable amount of timber was damaged. About 30 minutes later, another tornado (F2) was spawned, apparently by the same thunderstorm that produced the F3 tornado. This F2 tornado touched down in extreme eastern Madison Parish where it destroyed an unoccupied house.

The first tornado reported during this event in Mississippi was an F0 in the afternoon of the 20th. It was a long-path (28 miles) tornado with a 60-yard width. It touched down 7 miles southwest of Hazelhurst and moved north-northeasterly to 5 miles west of Byram where it dissipated. Since this was a weak tornado, little damage occurred—trees were blown down and a storage shed was destroyed.

Most of the severe weather for this event in Mississippi occurred during the late afternoon and early evening of December 21st and midmorning of the 22nd. An F2 tornado cut a 16-mile, 300-yard-wide swath in Leflore County where it destroyed several mobile homes, caused considerable roof damage, and damaged vehicles and farm implements, farm trailers, trees, and power lines. Near Belzoni, a 48-year-old man was killed by an F1 tornado when



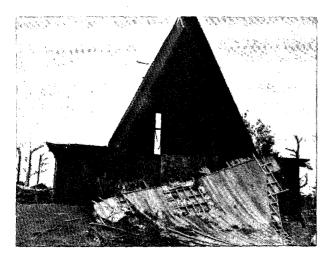
Friends and family sift through the rubble of the Arthur Bryant home at Thomastown, LA which was destroyed by a tornado on December 21st. Mary Bryant and their two grandchildren were in the house when the tornado hit at about 4:30 p.m. CST, but escaped without serious injury. Photo credit: <u>Madison Journal</u>, Tallulah, LA (Photographer: Nancy Graham).



This cotton trailer was wrapped around a tree by a tornado which struck Madison Parish, LA on December 21st. The owner, A. C. Ray, reported that ten of his cotton trailers were destroyed by the tornado. Two hay balers, a grain drill, a feed grinder, and a shed also were demolished when the tornado traveled down Highway 3030 near Thomastown. Photo credit: <u>Madison Journal</u>, Tallulah, LA (Photographer: Nancy Graham).

a large oak fell on the house he was in and crushed him. Granada County was struck by an F3 tornado which caused major damage to several homes, almost completely destroyed a well-constructed brick home, and destroyed a farm implement building. Another F3 tornado touched down 0.5 miles northeast of Bowling Green and cut a 20-mile-long, 880-yard-wide swath to 5 miles northeast of Vaiden before lifting. Approximately the first half of its path was through wooded and sparsely populated areas. Most of the damage caused by the tornado occurred after crossing Interstate 55 about 5 miles southwest of Vaiden. Before reaching Vaiden, several cars were blown off the highway, one tractor-semitrailer was overturned, five residences were severely damaged, and three mobile homes were destroyed. During the last few minutes of its path, the tornado practically leveled everything it touched. Fifty-five homes and mobile homes were destroyed, 29 homes suffered major damage, and 60 homes endured minor damage. Fifteen people were injured by this tornado, and one 12-year-old girl was killed in a mobile home northeast of Vaiden.

There were several other weak tornadoes in Mississippi during this event which caused damage to homes, farms, and trees. The only other injury reported was during an F1 tornado near Mendenhall. Five homes sustained roof damage and an elderly woman was injured in one of these homes.



The chapel in a church camp in Madison County, MS was struck by a tornado on December 21st. Wind entered the front of the chapel and blew out the back wall. *Photo was supplied by Jim Butch, WSFO Jackson, MS.*



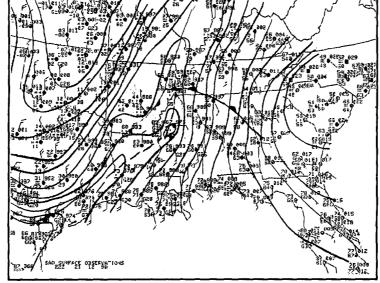
This well-constructed house, 6 miles southwest of Vaiden, MS was almost completely destroyed by the F3 tornado on December 21st. Photo was supplied by Jim Butch, WSFO Jackson, MS.



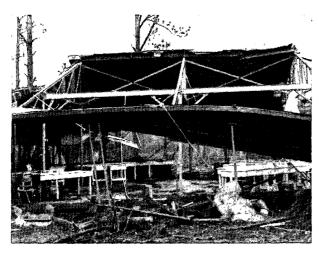
Mobile home and tree damage after the December 21st tornado struck 6½ miles southwest of Vaiden. Some of the material in the foreground was lifted and carried 90 feet. Photo was supplied by Jim Butch, WSFO Jackson, MS.



The December 21st F3 tornado lifted the mobile home, formerly at this location, completely off its blocks and caused extensive tree damage. Photo was supplied by Jim Butch, WSFO Jackson, MS.



Surface analysis based on hourly observation for 4:00 p.m. CST on December 21, 1990. Photo was supplied by Jim Butch, WSFO Jackson, MS.



One of many buildings damaged on December 21st by an F3 tornado that swept through this church-operated camp 9½ miles north of Canton, MS. Photo was supplied by Jim Butch, WSFO Jackson, MS.



The F3 tornado on December 21st completely destroyed this mobile home 2½ miles southwest of Vaiden, MS. The trees in the background were literally ripped away. Photo was supplied by Jim Butch, WSFO Jackson, MS.



Farm implement buildings destroyed by the F3 tornado on December 21st. This photograph was taken 7 miles north of Canton, MS. Photo was supplied by Jim Butch, WSFO Jackson, MS.



This mobile home was destroyed by the December 21st F3 tornado. This photograph was taken 7 miles north of Canton, MS. Photo was supplied by Jim Butch, WSFO Jackson, MS.



Part of a church-operated camp in Madison County, MS after the December 21st F3 tornado struck. This location is 9½ miles north of Canton, MS. Damage to this camp was estimated at \$1 million. Photo was supplied by Jim Butch, WSFO Jackson, MS.



At this location, 2 miles east of Holcomb, MS the December 21st F3 tornado caused relatively little damage. In other portions of its 3.5-mile-long, 440-yard-wide swath, six well-constructed homes suffered major damage and a farm implement building was destroyed. Photo was supplied by Jim Butch, WSFO Jackson, MS.

4. A STRONG (F2) TORNADO HIT ASHLEY COUNTY, ARKANSAS - DECEMBER 30, 1990

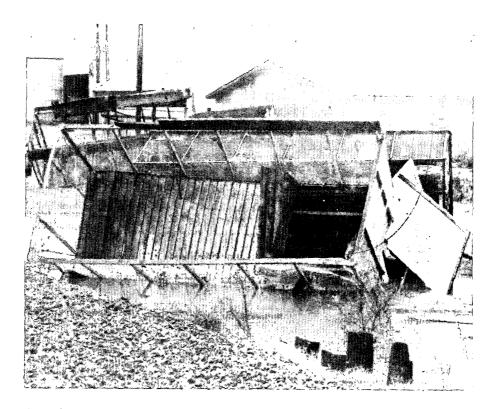
The peace and quiet of Sunday morning, December 30, 1990, ended abruptly at 11:25 a.m. CST as a tornado of F2 intensity struck southeastern Arkansas. The tornado touched down about 8 miles southwest of Parkdale in the Overflow National Wildlife Refuge. Trees were uprooted and a mobile home which serves as the headquarters was destroyed. The tornado remained on the ground for ten miles, cutting a swath to 100 yards in width. The southwestern part of town experienced several downed trees.

A garage and a car were destroyed by a falling tree. The tornado then moved down Main Street, damaging at least 13 buildings. Thirteen railroad cotton trailers were damaged; five were destroyed beyond recognition. The tornado lifted about 1 mile northeast of town.

Fortunately, no injuries were reported as a result of this tornado. Homes were spared major damage. Damage in Parkdale has been estimated at \$250,000.



Several buildings in Parkdale were damaged by the tornado (F2) that hit December 30th. In the above photograph, the Parkdale Auto and Farm store was seriously damaged. *Photo credit:* <u>Ashley County Ledger</u>, Hamburg, AR (Photographer: Edward Tucker).



One of 13 cotton trailers owned by J. D. Grice that was damaged by the December 30th F2 tornado in Parkdale, AR. Photo credit: <u>Ashley County Ledger</u>, (Photographer: Edward Tucker).

5. HEAVY RAIN AND FLOODING IN THE OHIO RIVER VALLEY - DECEMBER 28-31, 1990

Heavy rains associated with an area of low pressure and an Arctic cold front drenched parts of the Ohio River Valley late on the 28th and the morning of the 29th. Two and one-half to 3 inches of rain fell over northwestern Indiana during this period. The heavy rain, along with rapid melting of snow statewide (4 to 6 inches deep), caused flooding of many rivers and streams.

Many roads were closed due to high water.

Statewide, more than 4,000 residents were evacuated from over 2,000 residences—over 500 homes suffered major damage. In all, more than 1,700 structures were damaged to some extent. Private businesses and state and local facilities, such as roads, bridges, and water treatment plants, also were damaged. Levees suffered a wide range of damage; minor leaks to a complete washout of a 600-foot section of the Greenfield Bayou levee.

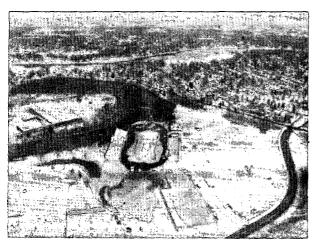
The next seven photographs were taken on December 31st at various locations in Indiana. The photographer was John T. Curran, WSFO Indianapolis, IN.



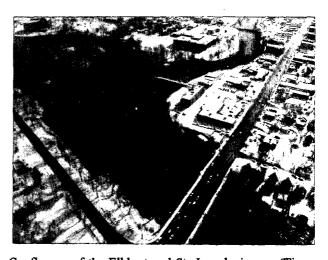
Kokomo, IN - Wildcat Creek—just west of Highway 31. Highway 31 is in the upper-right portion of the photograph. (Time - 10:20 a.m. EST)



South edge of Goshen, IN.



Flooded football field at Elkhart, IN. (Time - 12:20 p.m. EST)



Confluence of the Elkhart and St. Joseph rivers. (Time - 12:20 p.m. EST)



Plymouth, IN - Eight homes isolated by water.



Kankakee River crossing Highway 30 near Davis, IN. (Note all the water and ice in and out of the sun glare.) View is to the south. (Time - 1:30 p.m. EST)



Wabash River—looking north from the southern part of Lafayette, IN. (Time - 3:40 p.m. EST)

HEADING SOUTH ALONG THIS SAME ARCTIC COLD FRONT . . .

The following Special Weather Statement was provided by Bill Bunting, WSFO Norman, OK.

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE OKLAHOMA CITY OK
550 AM CST SAT DEC 29 1990

...STRONG COLD FRONT DROPPING TEMPERATURES RAPIDLY ACROSS CENTRAL OKLAHOMA...

A STRONG ARCTIC COLD FRONT MOVED THROUGH THE OKLAHOMA CITY METRO AREA THIS MORNING. AT 520 AM THE TEMPERATURE AT THE NATIONAL WEATHER SERVICE FORECAST OFFICE IN NORMAN WAS 59 DEGREES. SHORTLY THEREAFTER THE FRONT MOVED RAPIDLY THROUGH NORMAN AND AT 550 AM THE TEMPERATURE HAD DROPPED TO 27 DEGREES...A DROP OF 32 DEGREES IN 30 MINUTES. NORTH WINDS BEHIND THE FRONT WERE AVERAGING 20 MPH...RESULTING IN A WIND CHILL TEMPERATURE OF BETWEEN ZERO AND 5 BELOW.

TEMPERATURES WILL CONTINUE TO FALL THROUGHOUT THE DAY IN THE OKLAHOMA CITY AREA REACHING NEAR 10 BY EVENING. LIGHT FREEZING DRIZZLE AND LIGHT SNOW WILL BEGIN THIS MORNING AND WITH STREETS WET FROM EARLIER RAINFALL...TRAVEL WILL BECOME HAZARDOUS.

CORRECTIONS TO OCTOBER 1990 STORM DATA

1. Page 14 - Table of tornadoes - The "1" under the F0 column for RI should be under the F1 column.

CORRECTIONS TO NOVEMBER 1990 STORM DATA

- 1. Caption under middle-right photo on page 14 should read: "Ryan Bort stands where his front door..."
- 2. Page 15 The following was omitted from this page:

5. HIGH WINDS AND HEAVY SNOW IN MONTANA - NOVEMBER 1990

The north-central portion of Montana including the Blackfeet Indian Reservation experienced high winds and heavy snow during the last two weeks of November.

A storm system passing over the U.S. Northwest brought high winds to north-central Montana in the afternoon of the 23rd. East Glacier Ranger Station endured 70 mph winds with gusts to 100 mph. Judith Gap reported winds to 110 mph. A trailing cold front associated with this low pressure center dumped heavy snow on the northern mountains of Montana--as much as 4 feet at some locations before tapering off in the late evening of the 26th.

According to the Glacier Reporter (Browning,

MT), the town of Browning and the Blackfeet Indian Reservation community were "completely paralyzed" by the heavy snowfall. The daily maximum temperatures remained generally below freezing in this area for the next several days, making the experience more miserable for the local of human and animal populations.

High winds again added to the discomfort and danger of this situation on the 28th and prevailed into the first week of December. Wind gusts exceeded 90 mph. Large snowdrifts were created by these strong southwesterly winds and visibility was sharply reduced, closing roads along the northern front range. A water tower in Heart Butte was blown over as were several cars of a freight train at Browning.

DECEMBER 1990 NO. OF PERSONS ESTIMATED DAMAGE TIME LENGTH OF PATH WIDTH OF PATH LOCAL CHARACTER OF STORM **STANDARD** PLACE (MILES) (YARDS) ALABAMA **Mobile County** 03 0745CST Thunderstorm Wind 0802CST 03 0.5 Tomado (F0) At 0745 CST strong thunderstorm winds damaged numerous houses, and blew down trees and power lines in the Semmes and Wilmer areas, about 15- to 20-miles northwest of downtown Mobile. At Wilmer one mobile home was totally destroyed. One woman was injured inside the mobile home. At 0802 CST a small tornado moved northeast, over about a 0.50-mile path through the Mount Vernon area, where at least 30 homes were left uninhabitable and 20 others damaged. 03 0820CST 0 ? Thunderstorm Wind Washington County At Chatom a mobile home was blown off its blocks and trees and power lines were blown down in the same area. 03 0842CST n ? **Baldwin County** Thunderstorm Wind Trees and power lines were blown down at Lottie, Little River, and Tensaw. Several homes were damaged at Little River and Tensaw. ? **Butler County** 03 0920CST Thunderstorm Wind Trees were blown down at McKenzie. ? 7 Thunderstorm Wind Conecuh County 03 0930CST Trees were uprooted, and larger trees were blown across power lines at scattered locations in the northeastern part of the county. 03 0930CST **Escambia County** Thunderstorm Wind Strong thunderstorm winds damaged several planes, and also downed trees and power lines at the Brewton Municipal Airport. Three aircraft and one hangar were totally destroyed. 03 1010CST **Covington County** Thunderstorm Wind 1015CST 03 Thunderstorm Wind 03 1025CST Thunderstorm Wind At 1010 CST, trees were blown down in Andalusia; at 1015 CST, a barn was destroyed at Babbie; and at 1025 CST, trees were blown down at Opp. Crenshaw County 03 1010CST Thunderstorm Wind Trees were blown down at Honoraville. Coffee County 1045CST Thunderstorm Wind 1100CST Thunderstorm Wind 03 At 1045 CST trees and power lines were downed and one building was damaged 4 miles south of Enterprise. At 1100 CST a barn was damaged about 1 mile east of Enterprise. Pike County 03 1045CST ? O Thunderstorm Wind An awning was blown off a building and a tree was downed 1 mile south of Brundidge. A tree was blown across a road 4 miles west of Spring Hill. 1055CST Dale County Thunderstorm Wind 03 1105CST Thunderstorm Wind At 1055 CST, trees and power lines were blown down at Fort Rucker. At 1105 CST, trees were

downed, and one roof was damaged in Daleville by the same thunderstorm.

17

		NO OF ESTIMATED DECEMB	ER 1990											
	TIME	NO OF ESTIMATED DAMAGE												
PLACE	D LOCAL LENGTH OF	K I P C CHARACTER O D OF STORM B B B B B B B B B B B B B B B B B B B												
ALABAMA Con	ALABAMA Cont'd													
Geneva County	03 1105CST 03 1130CST	0 0 ? ? Thunderstorm Wind 0 0 ? ? Thunderstorm Wind												
	At 1105 CST, a large tree and several signs were blown down at Geneva. At 1130 CST, scattered areas in eastern Geneva County, thunderstorm winds also damaged four roc destroyed two barns, destroyed three automobiles, and blew down trees.													
Houston County	03 1110CST 03 1123CST	0 0 ? ? Thunderstorm Wind O 0 ? ? Thunderstorm Wind												
	At 1110 CST trees were blown down on the west side of Dothan, and at 1123 CST, severa houses were damaged in the same area.													
Henry County	03 1135CST	0 0 ? ? Thunderstorm Wind	Thunderstorm Wind											
	In the vicinity of Headland, a mobile home was demolished, trees and power lines were blown down, and a roof was blown off a barn; a satellite dish and pump house were destroyed in the same area. At Abbeville windows were blown out of a school during the same period.													
Colbert County	18 0810CST	0 0 ? ? Thunderstorm Wind												
	Strong thunderstorm winds in the damaged several roofs. In the same buildings received minor damage.	Muscle Shoals area blew a chimney onto automobil area, the roof was blown off one business, and sever	es, and al other											
Lauderdale County	18 0810CST	0 0 ? ? Thunderstorm Wind												
•	Trees and power lines were downe	d at Florence.												
Lawrence County	18 1000CST	0 0 ? ? Thunderstorm Wind												
	Trees were blown down in the Tov	vn Creek vicinity.												
Morgan County	18 1020CST	0 0 ? ? Thunderstorm Wind												
	damage path at Hartselle. Several	nds moved along a 4-mile-long and 100- to 300-yar roofs were torn off outbuildings and barns. Several va A barn which housed two small planes was destroyer received minor damage.	ehicles/											
Madison County	18 1100CST	0 0 ? ? Thunderstorm Wind												
	A roof was blown from an apartmen	nt complex, which also sustained considerable glass d	amage.											
Sumter County	18 1115CST	0 0 ? ? Thunderstorm Wind												
	Thunderstorm winds at York blew dog house was blown up into a tre	the siding off a house and damaged the roof of anotice.	her. A											
Limestone County	18 1125CST	0 0 ? ? Thunderstorm Wind												
	Several houses had shingles blown house and a fence was damaged.	off in Athens; in the same area, an awning was blow	n off a											

Trees and power lines were downed 10 miles west of Cullman; also in the communities of Berlin and Baileyton. The wind was caused by strong pressure differences near a cold front and not by thunderstorms.

0

?

?

High Wind

Cullman County

18 1145CST

DECEMBER 1990 ESTIMATED DAMAGE NO OF TIME LENGTH OF PATH LOCAL WIDTH CHARACTER PATH KOO LIKE PLACE STANDARD STORM (MILES) (YARDS) ALABAMA Cont'd 18 1200CST ? ? **Blount County** 0 0 High Wind One mile east of Snead, several roofs were blown off barns; several power poles and lines were also blown down. The wind was caused by strong pressure differences near a cold front and not by thunderstorms. ? **Choctaw County** 18 1300CST ? Thunderstorm Wind Tree limbs were blown onto power lines in the Butler vicinity. Montgomery County 18 1530CST High Wind A tree was blown down, damaging a house about 5 miles south of downtown Montgomery, with an outbuilding ripped apart in the same area. The wind was caused by strong pressure differences near a cold front. Colbert, Cullman, Franklin, Lamar, Lauderdale, Greene, Madison, Marion, Mosson, Jackson Morgan, Jackson, Winston, Marshall, Fayette, Sumter, 1600CST-23 1600CST 7 ? Flooding Flash Flooding Pickens, and Seven to 13 inches of rain fell during a two-day period, causing numerous bouts with flooding and flash flooding, over a wide area of northern and western Alabama. Many roads and bridges were washed out and many people displaced from their flooded homes. Flooding below the Guntersville Dam, on the Tennessee River, reached the second-highest level since the Tennessee Valley Authority dammed the river in the late 1930s. No deaths or injuries were attributed to the flooding; however, government officials estimated flood damage over the entire area would reach approximately \$15 million. A complete county breakdown was not available, although the counties of Colbert, Cullman, Franklin, Lauderdale, Lawrence, Madison, Marion, Morgan, Jackson, and Winston were declared disaster areas. Limestone Counties Jackson, and Winston were declared disaster areas. 30 1400CST ? Lauderdale County Thunderstorm Wind Numerous trees were blown down, 15 homes damaged, and a church steeple removed. All the damage occurred in the Petersville and Underwood areas, a few miles north of Florence. ? Thunderstorm Wind Colbert County 30 1435CST Power lines were blown down at Leighton. Limestone County 30 1515CST ? Thunderstorm Wind Trees and power lines were downed in the Mooresville vicinity. 30 1530CST ? Thunderstorm Wind Lawrence County At the Mallard Creek Campground, across the Tennessee River from Browns Ferry Nuclear Plant, numerous trees were blown down and a camper-trailer was blown over. **ARIZONA** AZZ003-Northeastern

An intense low pressure system developed over the western states, with high winds and blowing snow. Gusts to 65 mph were reported in Page, and some trees blown down in Jacob Lake. Cars were blown over on Interstate 40 east of Flagstaff.

?

Wind

19

Plateau

1515MST

;	E	(MILES)	(YARDS)	E D	Omomo		Š	STORM						
ARIZONA Cont	.'d													
Statewide	23 Morning			0	0	6	?	Cold .						
	Record cold conditions covered much of the state with many areas having the coldest morning in years. Yuma had a high temperature of 45°F which broke the old record of 53° set in 190 It was their coldest day since December 15, 1967, when the high was 44°. Tucson had a loof 21° and Phoenix had 26°. Flagstaff had a -23°F which tied for the coldest December d since 1978. Losses in Tucson and southern Arizona were expected to total more than \$1 million primarily because of pipes damaged by the freeze. Damage to the state's citrus crop were reported light, as growers took measures to protect their groves.													
ARKANSAS														
Pope County Atkins Scottsville	21 0130CST 0140CST			0	0	4	0	Lightning Lightning						
	Two houses v	Two houses were completely destroyed by lightning-initiated fire.												
Lincoln County Cades	21 0300CST	•		0	0	0	0	Hail (1.00)	·					
Craighead County Bono Cash	21 1000CST 1600CST		0	0	4	0	Flash Flood							
24	Heavy rain flo Cash.	ooded home	s in Bono	causi	ng at	least 8	0 evac	uations; roads were	flooded around					
Greene County Paragould	21 1000CST 1600CST	<u>-</u>		0	0	5	0	Flash Flood						
	The worst floot to surge out of and eastern pa	f its banks.	More than	200 [people	s nearl e were	y 4 inc evacua	thes of rain caused E ted from their home	ight Mile Creek s. The northern					
White County	21 1100CST 1900CST			0	0	4	0	Flash Flood						
•	Heavy rain flowere under wa 16, from Pang water in Search	gburn to Sea	across mo e portions o arcy, was o	ost of of Ari closed	Whit kansa I due	e Cour s High to brid	ity. Ir ways 3 Iges ur	n Newport, some lo 105 and 267. A port ader water. Streets	w-water bridges tion of Arkansas were also under					
Nevada County 3 NE Rosston Saline County	21 1215CST	• .*		0	0	0	0	Hail (1.00)						
East End Pulaski County	21 1253CST	•		0	0	0	0	Hail (1.00)						
Little Rock Lincoln County	21 1308CST	•		0	0	0	0	Hail (0.75)						
Cades	21 1500CST	•		0	0	0	0	Hail (1.00)						
ARZ005-006-007 008-010-012 Central Arkansas	26- 27			0	0	6	0	Ice Storm						

An ice storm paralyzed much of central Arkansas the night of the 26th, and most of the 27th. Downed trees and power lines left about 125,000 homes and businesses without electricity; some for several days. Ice-covered streets resulted in an estimated 100 accidents per hour, at one point, in the Little Rock area.

DECEMBER 1990

		TIME			NO OF EST PERSONS DA		NO OF ESTIMATED PERSONS DAMAGE			DECEMBER
PLACE	DA	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-1-HD	Omboc Let		URCOLV)	CHARACTER OF STORM	

ARKANSAS Cont'd

Jackson County Grubbs

29

0 0 5 0 River Flood

Heavy rains sent the Cache River over its banks flooding the town of Grubbs. About 50 homes were flooded, and 20 surrounded by the flood waters. The city's sewer system was also heavily damaged. The Cache is a very slow-moving stream, so it takes several weeks for the water to recede.

Miller County 8 NE Fouke

30 1100CST

1 1 0 0 Lightning

One woman was killed and another seriously injured when they were struck by lightning, while walking on a levee along a pond. (F32O)

0

Ashley County Parkdale

30 1125CST-1150CST

10

100 0

5

Tornado (F2)

Cold Wave

A tornado of F2 intensity moved through Parkdale causing considerable damage. The tornado first touched down about 8 miles southwest of Parkdale, at the Overflow National Wildlife Refuge. Trees were uprooted, and a mobile home which serves as headquarters, was destroyed. The tornado then moved northeast into Parkdale. Several trees were downed in the southwestern part of town. One tree fell on a garage and car, destroying them. The tornado then moved down Main Street, damaging at least 13 buildings. Several roofs were partially-to-completely blown off, with doors blown away and windows broken. Thirteen railroad cotton trailers were damaged, five destroyed beyond recognition. The tornado last struck about 1-mile northeast of town, where some irrigation pipe was damaged. Total path length was approximately 10 miles, with a maximum width of 100 yards. Damage in Parkdale was estimated at \$250,000.

CALIFORNIA, Northern

Sierra Nevada

1200PST-2400PST

0 0 0 0 Blizzard

A cold front pushed southward through the state during the latter portion of the 19th. In the Sierra Nevada, winds in excess of 60 mph, snowfall amounts up to 12 inches, and rapidly falling temperatures combined to produce blizzard conditions.

All Counties

20 0000PST-25 1200PST

3 0 7 9

In terms of crop damage, this cold wave was the most devastating on record. It may have been the coldest on record in the state of California. It struck from the 20th to at least the 25th, with cold temperatures in some areas persisting until the 31st. Numerous all-time minimum temperature records were broken, besting marks set in 1932 and 1972. The cold was devastating to the state's agriculture with conservative damage estimates in excess of \$1 billion. Property damage was also extensive with frozen plumbing the larger of the problems. At least three deaths were attributed to exposure. All-time lows were recorded on the 22nd at Sacramento Executive Airport (18°), Mather Air Force Base (17°), Mount Shasta City (-13°), Monterey (20°), Bakersfield Airport (19°), and Santa Cruz (19°). San Francisco came within 1° of its all-time low with 28°F reading.

CALIFORNIA, Southern

CAZ018

19 1900PST

0 0 ? 0 High Winds

Strong winds swept through the southern deserts, as the result of a cold low over the western interior. The winds affected all of southern California, but were especially strong in the Coachella Valley. Winds gusting to 60 mph cut power to thousands of residents in the valley, toppled trees, utility poles, and filled roadways with blinding dust and sand. Palm Springs Airport reported winds to 55 mph.

DECEMBER 1990

		TIME			PER	OF SONS	EST!	MATED AGE	
PLACE	D-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K .	CHINGLE.	4-58m3058-4	ODCODE!	CHARACTER OF STORM

CALIFORNIA, Southern Cont'd

CAZALL

20-31 All Day

1 0 ? 8 Cold, Freeze

A massive Arctic air mass moved over the western half of the United States, bringing record-low temperatures and the worst freeze to California since 1987. Many crops were either damaged, or completely lost. The most severely affected counties in southern California were Ventura, San Diego, Imperial, and Riverside. Most of the strawberry crop was lost in San Diego County. This freeze, along with the five-year-long drought, was very devastating to California farmers. In many areas frozen water pipes caused damage to homes and businesses. Hardest hit was the Lancaster-Palmdale area, or northern Los Angeles County. Some of the coldest temperatures in degrees fahrenheit were: Bit Bear -13°, Wrightwood -04°, Lancaster 03°, Daggett 07°, Victorville 09°, Mt. Wilson 10°, Thermal 14°, Santa Barbara 20°, Pasadena 26°, Long Beach 28°, and downtown Los Angeles 33°. Many mountainous areas recorded wind chills as low as -20° with one death attributed to the cold weather. A transient died of hypothermia in Anaheim and a motorist was killed in Lancaster when his car hit a patch of ice and skidded into a light pole. (M570)

COLORADO

Front Range COZ011 02 0800MST-03 0200MST

0 0 5 0 High Winds

Strong downslope winds in, and near, the northeastern Front Range foothills caused minor damage to property in portions of Denver, Boulder, Loveland, and Fort Collins. The strongest winds were recorded between 0900 and 2300 MST on the 2nd. Winds began howling in the higher foothills west of Fort Collins and Boulder, as early as 0800 MST, with one gust of 76 mph (shortly after 0800 MST) in the town of Rollinsville, west of Boulder. By midmorning, the strong ridge-top winds worked their way downslope and eventually eroded the nighttime temperature inversion, which had until then prevented the onset of high winds on the eastern plains.

Winds of 50 to 70 mph were first observed in a narrow zone from just west of Fort Collins, north to the Wyoming line, between 1000 MST and 1300 MST. The area of high winds then expanded south along the Front Range and into the Denver metropolitan area, where winds gusted to 58 mph (1300 MST) in Arvada, and 55 mph (1400 MST) in Lakewood. High winds continued to buffet the region throughout the afternoon and into the night, with a secondary surge of very strong winds in the Fort Collins area between 2000 MST (on the 2nd) and 0100 MST (on the 3rd). Automated weather stations recorded wind gusts of 70 mph (2035 MST) and 61 mph at 2300 MST, on the western side of Fort Collins during this secondary surge, and a peak gust of 87 mph shortly after 2030 MST, just south of Rollinsville.

Central, Southwestern and Sangre de Cristo Mountains COZ004-008-010-

12 0300MST-13 1100MST

0 0 0 0 Heavy Snow

Snow, heavy at times, fell during the 12th and throughout the morning of the 13th in the mountains, mainly south of Interstate 70. Southern portions of the northeastern Front Range foothills received heavy snow as well during the pre-dawn hours on the 13th. Storm totals varied from 4 to 8 inches in the Sangre de Cristo Mountains, 6 to 12 inches in the southwestern mountains, and 3 to 8 inches in, and near, the Front Range foothills. A few significant snowfall totals include: 6 inches in the southern foothills town of Cuchara, 10 inches in the San Juan mountain town of Platoro, 8 inches at the Mary Jane Ski Area in the mountains west of Denver, 9 inches at the Monarch Ski Area just west of the town of Salida, 10 inches at the Beaver Creek Ski Resort high in the central mountains, and 4 inches of wet snow in the town of Lafayette, southeast of Boulder. The snow in the Lafayette area fell within a 2-hour period, shortly before sunrise, and was blamed for numerous fender benders along U.S. Highway 36 between Denver and Boulder.

DECEMBER 1990

		TIME			NO.	OF SONS	EST II	AATED AGE	
PLACE	DAO-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KILLED	Ombo C. Z. 1	4-89m3020	CACORO.	CHARACTER OF STORM

COLORADO Cont'd

Mountains and Northwestern Plateau COZ001-002-004-008-010

14 0300MST-1800MST

The passage of a strong Pacific cold front and upper-level weather disturbance set off a period of hurricane force winds and heavy snow, in portions of the northwestern plateau and northern and central mountains. Snow began in earnest over the northwestern plateau during the pre-dawn hours. Winds reportedly gusted to over 60 mph in and around the cities of Steamboat Springs, Hayden, and Craig, shortly after passage of the front resulting in ground blizzard conditions, poor visibilities, and dangerous wind chills. Six to 12 inches of wind-blown snow blanketed much of the northwest by 1200 MST, with 7 inches in Steamboat Springs, 8 inches in Craig, and a foot of champagne powder in the town of Hayden. The heavy snowfall and high winds shifted east into the mountains soon after sunrise. Northwestern winds gusted to 70 mph at the Monarch Ski Area shortly before 0800 MST, and 80 mph at the Aspen Ski Resort an hour later. Blowing snow reduced visibility to near-zero, over many of the higher mountain passes in the northern and central mountains during the morning, and throughout much of the afternoon. Snowfall in the northern and central mountains ranged between 6 to 14 inches, with 8 inches at the Copper Mountain Ski Resort, and 7 inches at the Beaver Creek Ski Area. The Purgatory Ski Area in the southwestern mountains received 7 inches with the storm. Approximately 50 trees were blown down in the Wolf Creek Ski Area where power was knocked out for a period of time.

Front Range, Pikes Peak/Palmer Divide Southern Foothills Northeastern and Southeastern Plains COZ011-012-014-015-016

14 1030MST-15 1200MST

0 4 6 0 High Winds

The same Pacific weather system which hammered the northwestern plateau and mountains, with heavy snow and high winds overnight, plowed onto the eastern plains of Colorado shortly after 1000 MST. Low clouds and early morning dense fog on the eastern plains, quickly gave way to sunshine and very strong downslope winds, soon after passage of the front. Cold bora-type winds of 60 to 90 mph howled through many Front Range communities between the hours of 1030 and 2100 MST, with one gust of 97 mph reported in the town of Golden west of Denver, shortly after 1130 MST. High winds were also reported in the cities of Arvada, Boulder, Fort Collins, Lakewood, Longmont, and Loveland during the day. Winds toppled a number of utility poles and wooden fences along the Front Range, and blew out windows causing structural damage to a large apartment complex on the western side of Golden. Wind gusts of 70 to 100 mph caused considerable damage to several large billboards along State Highway 93, 9-miles north of Golden, as well as damaging the paint, trim, and glass on several vehicles in the area.

The Boulder area was apparently hardest hit by the hurricane-force winds, as western winds peaked to 120 mph on the city's southwestern side shortly after 1600 MST. Winds stripped the roof off a garage, a vacant gas station, and a house under construction on Boulder's southern side. In Boulder Canyon, west of Boulder, downslope winds toppled two cinder-block walls on a house under construction, and blew down several trees in and around the city. Four Boulder County women suffered injuries during the high-wind event. Injuries incurred were: a broken wrist, a mild concussion, bruises, and facial cuts.

Two tractor-semitrailer trucks were blown over as a result of fierce cross winds along State Highway 93 south of Boulder, sometime between 1300 and 1500 MST. Later that afternoon, cross winds were the cause of another truck roll-over on Colorado Highway 470, just southeast of Golden. Drivers of all three trucks suffered only minor cuts and bruises. Elsewhere, several vehicles were trapped in a blinding dust storm along U.S. Highway 36 between Denver and Boulder, near the Jefferson County Airport. Drivers were forced to stop alongside the highway for several minutes during the dust storm, and watched their vehicles being pelted with sand and gravel.

DECEMBER 1990

-			TIME			NO. PER	OF SONS	ESTII DAM/	MATED AGE	
	PLACE	D	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	() ()	Omaci. Z-		CACCOR!	CHARACTER OF Storm

COLORADO Cont'd

North of Fort Collins, winds gusted to 75 mph shortly before 1500 MST in the foothills town of Bellvue, and 70 mph (1800 MST) in the city of Wellington. In the mountains west of Loveland, 60 to 80 mph winds blew through the higher canyons, resulting in dangerous ground-blizzard conditions. Some of the strongest winds ever recorded hit the mountain community of Estes Park, hammering the city during the two-day wind storm. Winds were clocked in Estes Park to 85 mph at 1100 MST on the 14th, and again at 0800 MST on the 15th. Winds of similar strength whipped sections of the Pikes Peak/Palmer Divide, northeastern and southeastern plains, and the southern foothills. In southeastern Colorado, winds gusted to 62 mph (1800 MST) at the Colorado Springs Airport, 64 mph (1048 MST) in La Junta, and 60 mph (1242 MST) in the southern foothills community of Trinidad. Minor damage to buildings, fences, trees, and automobiles was reported in the Colorado Springs, Walsenburg, and Trinidad areas.

Front	Range
CO70	11 -

17 0300MST-0800MST

0 0 0 High Winds

Strong northwestern downslope-winds battered northern sections of the Front Range foothills, and adjacent high plains north of Fort Collins, during the morning of the 17th. Wind gusts of 50 to 70 mph were common, with a 70 mph gust (0428 MST) in Wellington, and 65 mph in the northern Front Range community of Rustic just before 0700 MST.

Routt County

18 0000MST-2300MST

0 0 0 0 Heavy Snow

Ten to 15 inches of fluffy powder buried the Steamboat Springs area during strong northwestern winds, with lesser amounts reported in the towns of Hayden and Craig.

Statewide COZALL

19-24

0 0 0 0 Record Cold

The first genuine surge of Arctic air of the season slipped into the northeastern corner of the state, during the afternoon of the 19th. Temperatures dropped abruptly through the evening as a strong Arctic cold front swung south across the state's eastern plains. On the following day, the bitter cold air spread west into the mountains, spilling over the continental divide and into the lower valleys on the western slope. The cold air, however, lost much of its punch by the time it reached the lower western valleys.

Temperature records were broken statewide, as daytime temperatures barely climbed above the zero mark in the mountains and east. The mercury remained at (or below) zero for 85.5 hours at the U.S. Weather Service Office in Denver, making it the third-longest period of sub-zero readings in 118 years of record keeping. In the southwestern mountains, the Wolf Creek Ski Area broke a 30-year record for cold, with its record low maximum of -4° on the 21st. That same day, the mercury plummeted to a low of -33° in Tiny Town, southwest of Denver, -26° in Castle Rock, and -30° in the mountain town of Florissant, west of Colorado Springs. Canon City, west of Pueblo, nearly broke its all-time record minimum with a low of -25° the morning of the 23rd. The frigid cold was prevalent in the high country as well, where nighttime temperatures dropped as low as -30° at the Winter Park Ski Resort the morning of the 23rd.

Southwestern Mountains COZ008

20 0600MST-1800MST

0 0 0 High Winds

High winds knocked out power at the Wolf Creek Ski Area for a time on the 19th. Winds gusted between 80 to 90 mph creating ground-blizzard conditions, dangerous wind chills, and poor visibility on many of the higher mountain passes.

Mountains, Front Range, and Southern Foothills COZ002-004-008-010-011-015

20 0600MST-21 1200MST

0 0 0 0 Heavy Snow

PLACE

TIME

LOCAL
STANDARD
PATH
(MILES)

TIME

LOCAL
STANDARD
PATH
(YARDS)

DOC ESTIMATED
DAMAGE

PERSONS

PATH
STANDARD
STANDARD
PATH
STANDA

COLORADO Cont'd

Heavy snow fell at many mountain locations, and along portions of the southern foothills and Front Range. Four to 10 inches of champagne powder blanketed the northern and central mountains, 1 to 2 feet in the southwestern and Sangre de Cristo Mountains, and 5 to 12 inches in and near the towns of Rye, Walsenburg, Bellvue, Fort Collins, and Boulder, along the eastern foothills. The two-day snow event dropped 21 inches of snow at Wolf Creek Pass, and 20 inches at the Purgatory Ski Area. Strong winds whipped the newly-fallen snow into 5-foot drifts at the Wolf Creek Ski Area. Other high-country snowfall totals include: 8 to 10 inches in the town of Telluride, 11 inches at the Irwin Ski Area just north of Gunnison, and 7 inches at the Beaver Creek, Mary Jane, and Vail Ski Areas in the central mountains.

Front	Range
COZO	11

7 0100MST-1200MST 0 0 0 0 High Winds

Strong northwestern winds during the morning of the 27th whipped newly-fallen snow in the higher Front Range foothills, into billowy clouds several hundred feet high. The snow plumes could be seen from cities miles away on the eastern plains. Fifty to 70 mph winds blanketed the Front Range. Winds gusted to 80 mph shortly before 0200 MST in the town of Rustic, in the foothills northwest of Fort Collins, and 84 mph later that morning (0600 MST) atop Fritz Peak, west of Denver. Wind speeds dropped off in most areas to less than 30 mph not long after 1200 MST, yet a few higher foothill locations continued to experience 30 to 50 mph gusts throughout the afternoon and evening.

Pikes Peak/Palmer Divide COZ014

28 0000MST-0700MST 0 0 0 0 High Winds

Strong crosswinds of 50 to 60 mph were believed to be responsible for toppling four empty coal-train cars near the town of Monument in southern Douglas County sometime around 0200 MST. A weather observer in the area recorded a wind gust of 63 mph about the time of the accident. No injuries were reported.

Front Range COZ011

30 0700MST-2100MST 0 0 0 High Winds

Strong downslope winds along the eastern slopes of the Front Range, created whiteout conditions north of Golden along State Highway 93, and in the Boulder and Longmont areas. Winds gusted to 91 mph (at 1316 MST) atop Table Mesa in southwestern Boulder, 76 mph (1729 MST) in Estes Park, 61 mph in Loveland (at 1530 MST), and 94 mph (at 1930 MST) near the foothills community of Rollinsville. The Boulder County Sheriff's Department reported (at 1340 MST) several downed power lines due to strong winds, near the Rocky Flats Plant, south of Boulder.

CONNECTICUT

CTZ006

04 0800EST-1100EST 0 0 0 0 Coastal Flood

Southern and southeastern gales, combined with an unusually high astronomical tide, produced to flooding on coastal roads along the eastern portion of the Connecticut coastline. No property damage was reported.

CTZALL 28 0200EST-

0900EST 0 0 0 0 Heavy Snow

The first significant snowfall of the season brought between 6 and 8 inches of snow to most of the state. The morning commute was affected by many (mostly minor) traffic accidents.

PLACE

TIME

D LOCAL LENGTH WIDTH K I P C CHARACTER OF STORM

PLACE

D STANDARD PATH L U P P STORM

(MILES) (YARDS) E B E S

DELAWARE

New Castle County North Wilmington

04 0630EST

0 0 5 0 Thunderstorm Winds

A downburst from a thunderstorm caused extensive damage to the top floor of an apartment building, with some structural damage to two adjacent apartment buildings. Damage was confined to an area about 50-yards wide where the downburst hit the ground, and fanning out some 250 yards to the northeast. Reports of tornadic activity could not be confirmed.

DEZ002-003

27 1800EST-28 1300EST

0 0 0 0 Heavy Snow

The first substantial snow of the winter deposited several inches across northern and central Delaware. Freezing and frozen precipitation mixed in over central Delaware and held storm totals down. Representative totals were: Greater Wilmington Airport (ILG) 6 inches; Dover AFB (DOV) 2 inches.

Kent County Smyrna

31 0230EST-0400EST

0 0 3 0 High Winds

High winds accompanying a cold front uprooted many trees and caused some structural damage to a few homes in the Smyrna area. Winds gusted to 45 mph at Dover AFB (DOV) at 0302 EST.

FLORIDA

FLZ001-003
Escambia County to
Washington County
Jay to Vernon

03 1005EST-1215EST

0 0 3 0 Thunderstorm Wind (G50)

A line of strong thunderstorms moved through northwestern Florida. Trees and power lines were downed near Jay (Santa Rosa County) at 1005 EST. Wind gusts to 58 mph were reported from Whiting Field Naval Air Station (Santa Rosa County) at 1023 EST. Numerous trees were uprooted and power lines downed in Milton (Santa Rosa County) and in Pensacola (Escambia County) around 1045 EST. Tree and power line damage moved east with the line. Damage was also reported just north of Crestview (Okaloosa County) about 1115 EST; then near De Funiak Springs (Walton County) at 1130 EST, Prosperity, New Hope, and Pittman (Holmes County) and near Vernon (Washington County) at 1215 EST.

GEORGIA

Terrell County Graves

03 1330EST

0 0 3 ? Thunderstorm Wind

Several large trees were broken off by thunderstorm winds, tearing down power lines. Power outages developed at Graves and over the surrounding area.

Mitchell County Camilla Countywide

03 1400EST

0 0 3 ? Thunderstorm Wind Lightning

Large trees, with diameters of 2 feet, were uprooted and broken off around Camilla and over Mitchell County. At least five power poles were broken and many utility lines were torn down, resulting in scattered power outages. Several minor fires were started by lightning.

					l NO	05	ECTIM	ATED		DECEMBER 1990			
		TIME			PER	SONS	ESTIM	ĜE					
PLACE	O-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K	OHING CAL		CROPS	CHARACTER OF STORM				
GEORGIA Cont'	d									_			
Baker County Newton	03	1400EST			0	0	3	?	Thunderstorm V	Vind			
Newton	03	1400EST			0	0	4	?	Flash Flood Lightning				
	A h diam rest	A house near Newton was struck by lightning and burned to the ground. Numerous trees, with diameters of 10 to 15 inches, were uprooted or broken from the top. Several power outages resulted. Minor flash flooding developed.											
Catoosa County 5 E Chickamauga	23	0100EST- 0545EST			0	0	?	?	Flash Floods				
Walker County Countywide	23	0100EST- 0545EST			0	0	?	?	Flash Floods				
Dade County Countywide	23	0100EST- 0545EST			0	0	?	?	Flash Floods				
Whitfield County Countywide	23	0900EST- 1200EST			0	0	?	?	Flash Floods				
	Heavy rainfall over extreme northwestern Georgia produced flash flooding when many area streams and creeks rose out of their banks, inundating many roads. In Catoosa County, portions of Chickamauga National Military Park were flooded when the South Chickamauga Creek overflowed.												
Floyd County Rome	23	1400EST			0	0	?	?	Flash Flood				
		ondary roae orgia.	ds around	Rome we	re flo	oded	as hea	avy ra	infall developed o	ver northwestern			
Habersham County Clayton Northern	27	Morning			0	0	?	?	Ice Storm				
Habersham County	the Co	northern su	burbs of A ound Clay	Atlanta and ton, scatte	norti	ı of A	Athens.	Over	reas of northern G the northern porti loped when ice-lad	on of Habersham			
IDAHO													
IDZ009 Northern Idaho	01 02	0000PST- 0000PST			0	0	0	0	Heavy Snow				
	Eig	ht to 18 inc	hes of sno	ow fell.									
ISZ001-002-004 Southern Idaho	01	1700MST 2100MST			0	0	5	0	High Winds (G	58)			
	Six inches of snow fell and a cold front reduced the visibility to zero on Interstate 84 in dust and light snow showers near Burley. Winds started power pole fires in Canyon County due to electrical shorts. Winds and icy conditions caused vehicles to slide off roads. Widespread power outages occurred.												

Fast-moving cold front winds downed numerous trees which cut power lines and blocked roads. A trucker was injured when a wind gust overturned his rig.

0

High Winds (35G56)

0 1 5

04 1200PST-1500PST

IDZ008-009

Northern Idaho

	т т			ı	Liia					DECEMBER 1990
		TIME		ļ	PER	SONS	DAMA	MATED AGE		1
PLACE	D B E	LOCAL Standard	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	Charle L.A.	ONIXOC-Z-		CROPS	CHARACTER OF STORM	
				L	L		1	<u> </u>		J
IDAHO Cont'd										
IDZ004 Southeastern Idaho	05	1300MST- 1500MST	-		0	0	0	0	Dust Storm (G40))
	Inte dust	rstate 84 wa during pos	as closed so st-cold from	outheast of nt rising p	the ju	inction	n of In	terstate	e 86 due to zero-visi	bility in blowing
IDZ001 Southwestern Idaho	13	0700MST- 0900MST	-		0	0	5	0	Snow	
	One Inte rush	inch of northern inches in the inches inches	ew snow o Ada and C ic.	with a ten Canyon cou	npera Inties	ture o durin	of 28° g a co	was ld fron	blamed for 50 traft t passage, which str	fic accidents on ruck the morning
IDZ002-003 Southeastern Idaho	13 14	1100MST- 0500MST			0	1	5	0	Heavy Snow	
	Sno over the	wfall accun rturned on l Pocatello D	nulated fro Interstate 1 District Sch	m 5 to 13: 5 in Pocat ools and 3	inche ello. 80 mi	s in co Snow nor tr	onjunct fall an affic a	tion wi d snow ccident	th a cold front pass ydrifts on the 14th c is on Interstate 14.	age. Two trucks caused closure of
IDZ004 Southeastern Idaho	14	0000MST- 0500MST	-		0	0	0	0	Blizzard (G43)	
	Inte	rstate 84 wa visibility,	as closed b in 40 to 5	etween Int 0 mph wit	tersta nd gu	te 85 a sts, fo	and Sn ollowin	owvill ng a co	e due to 3- to 4-foo ld front passage.	t snowdrifts and
IDZ009 Northern Idaho	17	1200PST- 1900PST			0	0	0	0	Heavy Snow	
	Bon a ve	ner County ry cold Arc	reported o	o to 8 inch	nes of	snow	/fall, a	ssociat	ted with warm air j	ust southwest of
IDZ003-004 Southeastern Idaho	17	1700MST- 1900MST	-		0	0	4	0	Ice Storm	
	Free	ezing rain d	luring the	evening tra	affic 1	rush-h	our ca	used n	nore than 30 accide	nts.
IDZ009	17	1900PST			0	0	4	0	High Winds	
Northern Idaho	Gus Cou	ty winds renty.	emoved the	e roof of a	a 70-i	foot n	obile	home	just north of Plum	mer in Benewah
Latah County Moscow	17	2040PST			0	0	4	0	Thunderstorm W	ind (G54)
Nez Perce County Lewiston	17	2300PST			0	0	4	0	Thunderstorm W	ind (G54)
	Dov an a	vned trees or rea of insta	cut power ability, ahe	lines and bad of a fas	olocko st-mo	ed roa ving I	ds, as Pacific	unseas cold f	sonable thunderstor ront south of an Ai	ms developed in retic cold front.
IDZ004 Southeastern Idaho	17	2300MST- 2400MST	-		0	0	0	0	Dust Storm	

Visibility on Interstate 84 southeast of Burley was reduced to near zero.

DECEMBER 1990

		TIME			NO OF PERSONS		ESTIMATED DAMAGE		
PLACE	DAOLE	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K) Limb	TAT DRIVE	4-88m00x80	COCOL	CHARACTER OF STORM

IDAHO Cont'd

IDZALL Statewide

7 1 30 Extreme Cold

Arctic air dropped from the Yukon into Idaho. The 500 mb height gradually lowered, to near 5200 meters on the 19th through the 22nd, and again on the 28th and 29th. At the surface, a Pacific cold front from the northwest moved across Idaho on the 18th with blizzards. This front was immediately followed by an Arctic cold front from the northeast; also with blizzards on the 18th and 19th. An Arctic air mass, surface high pressure system moved out of Canada, becoming centered over southwestern Idaho the 22nd through the 26th, with sub-zero temperatures more than 40° below normal. This sequential pattern was repeated on the 27th through the 31st. The Boise temperature of -25° on the 22nd, is the coldest Boise temperature in this century. The Pocatello temperature of -29° on the 23rd is Pocatello's coldest December temperature on record. Extreme wind chills between -40° and -85° were experienced over widespread areas. Numerous water pipes, mains, and meters froze and broke. An open window in a third floor toilet of the Idaho State Capitol Building allowed a water pipe to freeze and break, resulting in \$100,000 water damage. Plumbers were backlogged about five days. Some building fires started when blow torches were used to thaw pipes. Numerous buildings were closed because of freeze-up and school buses were unable to operate because heaters would not function. Truckers were stranded when diesel fuel solidified. Numerous automobiles stalled with ice-clogged fuel lines. Hundreds of tubeless tires were flattened when cold broke the air seal. Power and communications wires snapped; 15% of cable TV users lost their connection from one hour to two days. Huge chunks of ice blocked rivers. One pedestrian was killed by a motorist unable to stop on an icy road. Many people incurred broken bones by falling on icy walkways. Lung and heart injuries were reported to have been induced by the extreme cold. A virulent bronchial infection spread rapaciously. Outside construction work was halted, and construction workers were laid off. Fruit trees were unable to adjust to a sudden drop of temperatures, to colder than -20°, which resulted in estimated damages of \$7 million in Canyon County alone; inadequate snow cover was believed to be a contributing factor to fruit tree loss. was immediately followed by an Arctic cold front from the northeast; also with blizzards on the County alone; inadequate snow cover was believed to be a contributing factor to fruit tree loss. (A similar meteorological situation occurred in December 1972, with similar fruit tree losses in southwestern Idaho.)

IDZ003-004-012 Southeastern Idaho 18 0000MST-0800MST

5 0 Blizzard

Winds gusted to 50 mph with snowfall accumulations of 5 to 7 inches. Some state highways, and most schools were closed. Interstate 84 was closed from the junction of Interstate 86 to the Utah border after 0700 MST. The storm was associated with relatively warm air south of an Arctic air mass moving into Montana.

IDZ002 South-Central Idaho IDZ002-003-004-012 18 Southeastern Idaho

0200MST-0300MST 1700MST-0200MST

High Winds (G45) 0 0 0 0

Blizzard

High Winds (G35)

Snow accumulated from 5 to 18 inches with wind chills of -52° at Rexburg and -65° at Monida Pass.

IDZ008-009 Northern Idaho

2200PST-19 0500PST

5 0 0 Blizzard (G52)

Snowfall up to 8 inches was recorded, with visibility near zero due to blowing snow. Blowing gravel damaged cars and trucks. Falling trees caused numerous power outages and damaged some homes. This storm was associated with an Arctic cold front which dropped temperatures and caused wind chills between -45° and -60° .

IDZ004-006-011 West-Central and Southeastern Idaho IDZ002-012 Southeastern Idaho

0300MST-19 1800MST 0700MST-

High Winds O O 0 5

Wind chills of -85° were experienced on the morning of the 20th. Interstate 15 and Highway 32 were closed due to extreme cold and blowing snow, reducing visibility to zero. Truckers reported diesel fuel turned to gel.

5

0

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME LENGTH OF PATH WIDTH OF PATH LOCAL CHARACTER PLACE STANDARD STORM (YARDS) (MILES)

IDAHO Cont'd

Ada	County
Ro	ice ´

1700MST-1300MST

Unusual Cold

Boise experienced 92 consecutive hours of sub-zero temperatures.

IDZ001-002-005 Southwestern Idaho

1200MST-0200MST 20

5 1 0 Heavy Snow

Snow accumulated from 4 to 6 inches. The initial 1 to 2 inches of snow caused dozens of vehicle accidents, involving from five to 12 vehicles. Evening commuter traffic in Boise was virtually gridlocked from 1630 MST to 1930 MST, by 3 to 5 inches of snow. Interstate 84 between Boise and Meridian was closed at 1600 MST due to numerous accidents, and motorists were stranded on Interstate 84 from Mountain Home to Rupert during the night by blizzard-like conditions. Snow accumulation forced school closures on the morning of the 20th in Canyon County. County.

Bannock County Pocatello

0300MST-0945MST

0 Ice Jam Flood

Floodwaters rose within inches of the top of concrete flood controls, built after the floods of 1962 and 1963. Five hundred volunteers filled 45,000 bags of sand in sub-zero temperatures and 20 homes were evacuated.

IDZALL Statewide

22

Extreme Cold

Temperatures dropped to -58° at Morgan Creek (26 miles north of Challis), -54° at Bancroft, -46° at Stanley, -28° at Soda Springs, and -25° at Boise and Pocatello. Modest wind velocities caused wind chills to -65°. The maximum temperature for the day of -6° at Boise, is the all-time-coldest maximum temperature on record (at Boise). The AMTRAK was 17 hours behind schedule due to "extreme cold."

IDZ002-004-011

Central and Southeastern Idaho

1800MST-26 0700MST

0

Heavy Snow

Six to 13 inches of fresh dry powder delighted Christmas Holiday celebrants with good driving traction.

IDZ008-009 Northern Idaho 0400PST-

1700PST

Heavy Snow

A Pacific cold front produced 4 to 10 inches of snow.

IDZ001-002-003-

004-012 Southern Idaho

0500MST-27 0800MST

1 5

Heavy Snow

Six to 15 inches of new snow was reported. Gusty winds and zero-visibility caused near-blizzard conditions on the 27th and again on the 29th, contributing to numerous accidents. Drifting snow closed roads soon after being plowed. Interstate 84 was closed by 4-foot drifts between Burley and the Utah border until noon on the 29th.

IDZ011

0900PST-North-Central 0900PST Idaho

0 0 Heavy Snow O

Six to 10 inches of new snow accumulated.

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME LENGTH OF PATH WIDTH OF PATH LOCAL ROPS CHARACTER **PLACE STANDARD** STORM (MILES) (YARDS) Б

IDAHO Cont'd

IDZ009-008 Northern Idaho

1700PST-0400PST

0 0 0 Blizzard

Strong winds following the passage of an Arctic cold front moved into Idaho from Canada. Snow accumulated from 6 to 23 inches.

IDZ006-007-010-012 28 Central Idaho 29

Central Idaho

0700MST

0

Wind Chill

The wind-chill temperature was colder than -40°F.

IDZ008-009-004-011

Northern and Southeastern Idaho

0800PST-31 1730PST

0 5 0

Blizzard

New snow accumulated from 4 to 11 inches. Some highways were closed several hours due to drifting snow. Numerous vehicles slid off roads with snow depths between 1 and 2 feet. Extreme wind chills occurred with sub-zero temperatures in southeastern Idaho.

ILLINOIS

ILZ001-007 Northwestern Illinois

1800CST-0600CST

6

Winter Storm

Heavy snow fell over the northwestern one-third of Illinois from Sunday evening, December 2nd, through Monday morning. High winds caused severe damage to power lines and trees. In McHenry County, a gust to 63 mph was reported at 0330 CST, December 3rd. Total snowfall ranged from 2 to 3 inches in Tazewell County (ILZ007), to 12 inches or more over Carroll, Stephenson, and Jo Daviess counties (ILZ001) in the northwestern corner of Illinois. Winds of 50 mph were widespread. A doctor leaving a hospital in Cook County injured his back, as a result of being blown down by the wind. Many areas suffered power outages until early Tuesday, December 4th; especially near Peoria.

Macoupin County 26 NNE ALN

14 2230CST

0 O 2 Thunderstorm Wind

Power lines were downed by thunderstorm winds.

ILZ008-015 Southern Half Illinois

Evening 30

0 7 0 Winter Storm

Beginning Friday evening, December 21st through the 30th, the southern half of Illinois suffered a series of ice and snow storms. This combination caused widespread problems for roads and traffic, and extensive damage to trees and power lines. The storm track was northeast across this area, so combinations of freezing rain and sleet caused heavy glaze, while snow fell to depths ranging from 3 to 7 inches; although Jefferson, Perry, and Franklin counties reported 8 to 10 inches of snow during this week.

ILZ003-ILZ008-015 31

6 5 Floods

O

The flooding problem over much of northeastern Illinois through the southeastern half of Illinois, which began in late November, continued through the month of December. Problems were compounded over the Wabash and Illinois River drainage areas by ice and winter storms.

ILZ007 Peoria

31

0 Record Precipitation

Peoria Weather Service Office reported 1990 as the wettest year since records began in 1856. A total of 55.63-inches liquid precipitation fell, also the wettest July and summer occurred.

DECEMBER 1990

INDIANA

North-Central

04 0430EST-2100EST

0 0 ? ? Heavy Snow

Strong northwestern wind in the wake of a deep low-pressure system and cold front, produced lake-effect snowfall over north-central Indiana with amounts from 4 to 6 inches. Considerable blowing and drifting of snow reduced visibility as low as 0.25-mile.

Southern and Southeastern 17 1200EST-18 1500EST

0 0 ? ?

Heavy Rain Flooding

Two to 2.50 inches of rain fell over southern Indiana, causing flooding of rivers and streams. The Blue and Muscatatuk Rivers in southern Indiana were well above flood stage from the heavy rainfall. Readings along the Muscatatuck River in southern Jennings County, were as much as 9- to 10-feet above bankfull and at the highest level since the May 1990 flood event.

Statewide

22 0300EST-24 0200EST

0 0 4 ?

Heavy Snow Ice Storm

Heavy snowfall during the period also occurred over the state with freezing rain, which fell on the 22nd, underlying the snow. This combination of snow over ice created hazardous travel conditions over most of the state. Two inches of ice accumulation was reported over southern sections of the state on the 22nd, which led to numerous traffic accidents, and the deaths of four people. Snowfall totals for the 23rd and 24th were 2 to 3 inches across the south, with 6 to 7 inches over central and northern Indiana.

Central and Southern

27 0500EST-2200EST

0 0 ? ? Heavy Snow

A winter storm caused heavy snow across central and southern portions of the state. Storm totals were around 4 inches at Evansville and Indianapolis, with a band of heavy snow of up to 7 inches, from Vincennes to Bedford to Bloomington and Seymour. Warm southwesterly winds following the storm produced dense fog over central and southern Indiana and further complicated travel conditions.

Northeastern Allen, Huntington and De Kalb Counties 29 1500EST-1900EST

0 0 5 0 Flash Flooding

A combination of rainfall, to 3 inches in a 24-hour period, and snow melt, produced flash flooding of streams and rivers. Specifically, flooding was reported along the Little River in Huntington County, Cedar Creek in De Kalb County, and Spy Run, Jump, and Trier Ditch in Allen County. In Huntington County, 38 homes were damaged by floodwaters; De Kalb County reported 10 homes were damaged and in Allen County 21 homes suffered damage. Sandbagging operations took place along Little Creek, Spy Run Creek, and Jump Ditch.

Statewide

28 2100EST-31 2400EST

0 0 0 ? Flooding Heavy Rain

Heavy rains (2.50 to 3 inches) fell over northwestern Indiana late on the 28th, and the morning of the 29th. Rapid melting of snow, statewide, which measured a depth of 4 to 6 inches, caused flooding of numerous rivers and streams. Numerous state and county roads were closed due to high water. The Federal Emergency Management Agency listed the following information directly related to flooding across the state. Over 1,700 structures were damaged by the flooding, with major damage reported to over 500 homes. Over 2,000 residences were evacuated from flood-threatened areas, which involved a total of over 4,000 Indiana residents. Very significant damage was also incurred to private businesses and state and local facilities, such as roads, bridges, and water-treatment structures. Several levees in the southern portion of the state also experienced breaks, ranging from minor leakages to a 600-foot section of the Greenfield Bayou Levee, which was completely washed away.

DECEMBER 1990

		TIME			NO.	OF SONS	EST II	AATED AGE	
PLACE	DAO-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KILLI		A-COMMONA	CACCAC	CHARACTER OF STORM

INDIANA Cont'd

More specific flooding reports include the following:

Dec. 29 - Because of the flood on the Ohio River, Pigeon Creek in Evansville flooded and a few evacuations were necessary.

Dec. 30 - An ice jam on the Kankakee River threatened Sumava Resorts in northern Newton County. Localized flooding was at record levels. Water flowed over U.S. Highway 41, and rain of 3.50 inches fell locally. The ice jam was broken by afternoon.

Bowman ditch in South Bend overflowed, flooding 50 homes. Some evacuations were required, which had also occurred three previous times during the last several months.

The substation providing power to Rushville in Rush County, and the surrounding area, was threatened by rising water. Four inches of rain flooded the area surrounding the power substation, with water rising to within a few inches of the building. Pumping efforts of local fire departments averted this disaster. The wastewater treatment plant was flooded by local drainage and workers were evacuated. Several homes were flooded in Rushville with a few requiring evacuations.

Flooding struck the Whitewater River for the first time since May 1968. Flooding at Connersville in Fayette County entered the FOP facility. Water in the local park was 4- to 6-feet deep. Several mobile homes were flooded along the Whitewater River in southeastern Franklin and northeastern Dearborn counties.

Dec. 31 - In Hamilton County, over 100 homes were flooded. Twelve were flooded in Noblesville and many more in Riverwood. Homes were also flooded in the Trails End area.

Howard County - Two hundred fifty homes and a business were flooded by Wildcat Creek, which is the worst flooding since March 1913. Many persons required evacuation.

Fulton County - Lake Manitou was again threatened by floodwaters; however, the repair work completed on flood control structures in August prevented damage.

Marion County - An official order of evacuation was given for areas in Ravenswood early on December 31st. Nearly 400 homes in the Ravenswood area had first-floor flood damage. At least 1,000 homes were affected to some extent. Areas such as Frog Hollow were also flooded. (Harding and Try Streets)

Morgan County - Thirty homes were evacuated in Waverly.

Montgomery County - Approximately 60 homes were flooded in the northeastern portion of Crawfordsville. A campground had one trailer swept away, and several others severely damaged. A wastewater treatment plant was flooded as were four businesses.

Delaware County - Sixty homes were affected in the county; the most significant problems were in Albany, which was flooded by the Mississinewa River.

Brown County - The wastewater treatment plant was flooded at Nashville. An apartment complex was flooded, as were a few local businesses.

Bartholomew County - Flooding closed the Interstate 65 entrance ramp and forced the closing of the Bob Evans Restaurant and a motel. The parking lot of the Holiday Inn was flooded and a small lake was left in a nearby park area when the water receded. A dam was nearly washed away near Hope, as overflowing waters cut an emergency spillway.

Jackson County - Nearly 70% of the county was under water. Evacuations were required in Rockford, Shield, and the Brownstown areas.

Shelby County - The Little Blue River flooded. The National Guard Armory and a local body shop were flooded and several residences had to be evacuated. A local levee almost failed because of the Big Blue River flooding. This failure would have flooded many homes. Also, a 60,000-gallon oil storage tank was almost carried away by the flood waters but the local fire department pumped water from the tank storage area.

Also, a countless number of roads were flooded in northern and central Indiana.

DECEMBER 1990

		TIME			NO OF PERSONS		ESTIMATED DAMAGE		
PLACE	DAO-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	C L	OHIMO C.E.		WTO TO	CHARACTER OF Storm

IOWA

IAZ002-003-005-006-007-008-009-010-011-012-013-014-NEZ010-ILZ004 Much of Iowa

1400CST-1700CST

Heavy Snow

Low pressure moved out of the Rockies and re-formed over northwestern Oklahoma. It then tracked northeasterly through Missouri, into southeastern Wisconsin. Snow broke out over southern Iowa during the afternoon of the 2nd, then spread north during the late afternoon and evening hours. During the evening of the 2nd, and early-morning hours of the 3rd, the precipitation fell as a mixture of snow, sleet, and freezing rain over about the southeastern half of Iowa. The icing was not major, but caused very hazardous driving conditions as it fell on top of the newly-fallen snow. By the time the snow ended on the afternoon of the 3rd, 6 inches or more had fallen on all but the northwestern, southwestern, and southeastern corners of the state. Eight to 12 inches of snow fell in a large area extending from parts of south-central, through central, northeastern, and parts of north-central and east-central Iowa. One foot or greater amounts were measured in a narrow band extending from northeast of Des Moines to Vinton, and also around the Dubuque area. Dubuque had the greatest official amount; with 15 inches. Unofficial totals of around 17 inches were reported from the Dubuque area. Some of the heavy snow was the result of thunderstorms over the southeastern half of the state during the night of the 2nd, and early morning of the 3rd. Winds caused considerable blowing and drifting of snow; they were reported in the 20 to 30 mph range, with gusts of 40 to 50 mph at times. The highest wind speed reported was a 69 mph wind gust, from the Law Enforcement Center of Howard County, in Cresco. Winds gusted to 56 mph in Dubuque at around 0300 CST on the 3rd. There were numerous reports of minor damage around the state, such as awnings being broken off by the weight of the snow. The most significant damage report came from Iowa City. Heavy snow accumulation on the dome roof of a sports stadium there caused it to collapse on the morning of the 3rd, at around 0530 CST. Damage estimates were around \$2 million. Scattered reports of power

IAZ001-002-003-005-006-007 North-Central and Northeastern Iowa

0900CST-1900CST 17

0 0 Snow Heavy Snow

Snow developed in the wake of a cold frontal passage in Iowa. The significant snow fell over north-central, into parts of northeastern Iowa. Amounts ranged from 3 to 7 inches in those areas. South of that, precipitation fell as a mixture of rain, freezing rain, ice pellets, and snow. Amounts were quite light, but the ice pellets and freezing rain caused icy road conditions over approximately the northwestern half of Iowa.

IAZ001-002-003-004 005-006-007-008-009-010-011-012-013-014-015-SDZ018-NEZ010-ILZ004 All of Iowa

0800CST-2100CST 20

Freezing Drizzle Ice Pellets

A strong Arctic cold front moved across Iowa. The cold air was very shallow at first, but also extremely cold. Temperatures fell quickly from the 30s and 40s, into the single digits and teens, in its wake. Since the air aloft was still above freezing, widespread freezing drizzle and some freezing rain occurred. As the Arctic air became deeper, ice pellets were also mixed with the freezing precipitation. The freezing precipitation persisted until temperatures fell below -5°. Although the amounts were quite light, roads became very hazardous, and accidents very numerous. Road surfaces became like skating rinks and many cars ended up in the ditches.

DECEMBER 1990

		TIME			NO.	OF SONS	EST II	AATED AGE	
PLACE	D40-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-1-1110	OMMOC E-	4-8mm4020-4	NTOWO	CHARACTER OF STORM

IOWA Cont'd

LAZ002-003-006-007-

008-009-010-011-012-013-014-015-**II.**7004

1700CST-1200CST

Freezing Drizzle Freezing Rain

Southeastern Half of Iowa

Moisture from the Gulf of Mexico streamed into Iowa, ahead of an Arctic cold front. Freezing precipitation developed over south-central into northeastern Iowa during the early-evening hours of the 28th. Most of it changed to rain by the late evening, over south-central into east-central lowa. As the Arctic cold front moved in, the precipitation changed back to freezing drizzle. The ice accumulation was not very large, but was enough to cover road surfaces completely with an ice layer. Accidents were too numerous to mention, with hundreds of cars and trucks in the ditches along the interstate highways alone.

KANSAS

KSZ001-017 Statewide

20 0000CST

Extreme Cold

All of Kansas was under the influence of Arctic air, which dropped temperatures to as low as -17° at Goodland. Strong northern winds produced wind chill temperatures of -45 to -55°. The Arctic chill continued through the 23rd.

KENTUCKY

Graves County

18 1515CST

2 3 0 Flood

One man died, and two were injured, as a bridge over a swollen creek collapsed. The men were sent to work on the bridge and had parked their truck on it. After they got out of the truck, the bridge collapsed, trapping 23-year-old Mark Wiggins under the truck. The other two men were taken to a hospital and released.

Barren, Butler,

Barren, Butter,
Edmonson, Logan,
Simpson, Todd,
Warren, Christian,
Muhlenberg Counties
Between 2 and 5 inches of rain fell over the area in a 48-hour period, with the heaviest rain falling during the morning of the 18th. The heavy rain forced many streams and creeks out of their hanks. Some of the worst flooding occurred in Hopkinsville, in the Cherokee Park

The homes were evacuated, and 35 had water in them, as the South Fork their banks. Some of the worst flooding occurred in Hopkinsville, in the Cherokee Park subdivision. Twenty-five homes were evacuated, and 35 had water in them, as the South Fork of the Little River swelled over its banks. All the counties reported water over roads and streets, and some additional evacuations of homes.

Bulter, Ohio, Muhlenberg Counties 18 1530CST

3 Flood

Heavy rain forced the Green and Rough Rivers out of their banks. Most of the flooded areas were bottom-land used for farming. With additional rain, the rivers remained in flood through the end of the month.

Hardin County Shelbyville County

18 1630EST

5 3 Flood

Two days of heavy rain forced streams and creeks out of their banks. Several homes were evacuated and many roads were covered with water. The Rolling Fork River at Boston rose 8 feet above the flood stage.

Pulaski County

18 1630EST

Flood

Between 2 and 5 inches of rain, over a 24-hour period, forced many streams and creeks out of their banks. At least two homes were evacuated and several more reported water in their basements. Many roads were blocked by high water.

DECEMBER 1990

		TIME		, , ,	NO.	OF SONS	ESTIN	AATED AGE		
PLACE	D A E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-(Luo	I N J URLED	~- com 00.00 o	CACCAC.	CHARACTER OF STORM	

KENTUCKY Cont'd Clark, Franklin, Bourbon, Mercer, Woodford, Harrison, 18:1630EST 5 3 Flood Fayette, Scott High water forced many streams and creeks out of their banks, after 2- to 4-inches of rain fell over the area in a 24-hour period. One of the hardest hit areas was Paris, in Bourbon County. Twenty-five families were evacuated as the Stoner and Houston Creeks rose out of their banks. Counties All the counties reported water over roads, and water in the basements of many homes. In addition, the South Fork of the Licking River at Cynthiana crested 1 foot above the flood stage of 20 feet. Pendleton, Boone, Carroll, Gallatin 18 1630EST 3 Flood Heavy rain in a 24-hour period forced the Licking River at Falmouth and McKenneysburg into flood. The river at Falmouth crested at 29.8 feet, almost 2 feet above the flood stage. In addition, heavy rain forced many small streams and creeks to flood. Several homes were Counties flooded, and many roads were covered with water. Boyd, Carter, Elliott, Greenup, Johnson, Lawrence, Lewis, Martin 18 1700EST 3 O n 5 Flood Counties Heavy rain in a 24-hour period forced the evacuation of several homes in the area. All listed counties reported roads covered with water, as most of the small streams and creeks rose out of their banks. Breathitt, Jackson, Magoffin, Lee, Wolfe, Morgan, Owsley Counties 18 1730EST 5 3 Flood Continuously heavy rain forced small streams and creeks to flood. Many roads across the area were covered with water. Several homes were evacuated, and many homes had water in their basements. Warren County 19 1500CST Flood The Barren River at Bowling Green rose above the flood stage of 28 feet. Hart, Edmonson, 19 1700CST 3 2 Flood McLean Counties The Green River at Munfordsville, Brownsville, and Calhoun rose above its flood stage. Most of the flooded area was farm bottom-land. Magoffin County 19 1800EST 2 Flood After a day of heavy rain across the region, the Licking River at Salyersville rose above the flood stage of 19-feet. Adair County 22 0115EST 0 0 Flood A 7-year-old boy drowned when he was crossing a swollen creek on his father's shoulders. The father stepped into a deep hole and went under water. The young boy was swept away, and the body was discovered several days later, about a mile down the creek. 0 22 0810CST 3 0 Flood **Grayson County**

Three people were injured, as their car was washed off the road after a levee broke on the Bayou de Chien Creek. The car was swept into the creek, and workers at the scene helped the three elderly people from the car. The trio was taken to a hospital and later released.

NO OF ESTIMATED

DECEMBER 1990

		TIME			NO. PER	OF SONS	ESTI! DAM/	MATED AGE		
PLACE	D A E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	איייישט	OMWCC-Z-	A-COMING NO.	NTOXO.	CHARACTER OF STORM	
KENTUCKY Co	nt'd								: •	
Jefferson County	22	1300EST			0	0	3	2	Flood	$(x,y) \in \mathbb{R}^{n \times n}$
	The stag	e Ohio Rive ge. Several	r at Louisv homes in	ville rose to the area w	56 f ere e	eet on vacua	the lo	wer ga id a fe	ge. This is 0.5-foo w roads were cover	t above the flood red with water.
Union County	22	1500CST			0	0	3	2	Flood	
	The	e Ohio Rive ough the en	er at Unio d of the m	ntown ros onth.	e abo	ve th	e floo	d stage	e of 37 feet and re	mained in flood
Warren County	22	1500CST			0	0	3	2	Flood	
	The	e Barren Riv	ver at Bow	ling Greer	1 rose	sligh	tly ab	ove the	e flood stage of 28	feet.
Clinton, Pulaski,	22	2300EST			0	0	4	3	Flash Flood	
Wayne Counties	He:	avy rain fall nes were ev	ing on alre acuated, a	ady-satura nd many r	ted groads	ound were	forced covere	many d with	creeks and streams water.	to flood. Several
Bell, Jackson,	23	0230EST			0	0	5	4	Flash Flood	
Lee, Knox Counties	From reg	om 2 to 4 incion. The wine Roth Ca odwaters roulitional hom	ches of rai forst floodi mp area. se to nearlies were ev	n falling or ing occurre In Middle y 10 feet a vacuated ar	n alre ed in sboro along nd ma	ady-sady-sady-sady-sady-sady-sady-sady-s	aturate County Iy 100 nain st ads we	ed grou , wher) people treet of ere cov	and caused major flore several homes had be required rescue of f town. In all the vered with water.	ooding across the l to be evacuated rom their cars as counties, several
Livingston County McCracken County	23	1500CST			0	0	3	3	Flood	•
	The thre	e Ohio Rive ough the en	er, at Smit d of the m	hland and onth. Mo	Paduest of	cah, r	ose ab ooded	ove th area w	e flood stage and r vas bottom farmland	emained in flood
Bell, Knox,	23	1600EST		•	0	0	4	3	Flood	

10000521 Whitley Counties

The Cumberland River rose out of its banks. At Williamsburg in Whitley County, the river rose to 28 feet; 7 feet above flood stage.

2 **Owsley County** 23 1600EST Flood

> The South Fork of the Kentucky River at Booneville rose to 31.4 feet. This was 4.4 feet above the flood stage.

3 30 1510EST Flash Flood

Around 1 inch of rain in two hours, falling on already-saturated ground, forced creeks and streams out of their banks. One bridge was washed out, and many roads were covered with water.

Jackson, Lee, Wolfe Magoffin, Breathitt, Owsley, Clay Counties

Morgan County

0 5 3 30 1615EST 0 Flood

Another significant round of flooding hit southeastern Kentucky. Following rainfall of 1 to 3 inches, the flooding began in the afternoon and continued through the evening. This heavy rain, falling on already-saturated ground, sent many streams and creeks into flood. Several homes and businesses were flooded, and many roads were covered with water.

	T	7	Τ	l NO	0.5	FOTIL	44.750		DECEMBER 1990
	TIME			PER	SONS	DAMA	AATED AGE		
PLACE	D LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-1-ED	CHING CE	~ 	Cacoalo	CHARACTER OF STORM	
KENTUCKY Co									
Boone, Grant, Maso Owen Counties	n,30 1630EST			0	0	4	3	Flood	
	Heavy rain, flood. Sever	falling on a al homes an	already-sati id business	irated es we	grou ere flo	nd, fo oded,	rced n	nany creeks and si any roads were cov	mall streams into vered with water.
Rockcastle County	30 1630EST			0	0	3	2	Flash Flood	
	Between 2 an creeks out of	d 3 inches their banks	of rain fell , flooding	over some	a 3-h build	our pe lings a	eriod. nd clo	This heavy rain fo	orced streams and
Pulaski County	30 1720EST	[0	0	3	2	Flash Flood	
	A car was wa	shed away	in Somerse	et, as	a cre	ek rose	rapid	ly out of its banks.	•
Adair County	30 1745EST	7		0	0	3	2	Flash Flood	
	Russell Creek rose out of its banks as 2.50 inches of rain fell over a short period of tim Several roads were covered with water.								
Boyd, Greenup, Johnson, Lawrence, Martin Counties	30 1915EST	•		0	0	5	4	Flood	
	From 1 to 3 is streams to ris homes were f	nches of rain e out of the looded.	n fell on alı ir banks. N	eady Many	-satura roads	ated gr and st	ound. reets v	This caused rain-svere covered with v	wollen creeks and vater, and several
Garrard, Rowan,									
Clark, Bourbon Counties	30 1915EST	•		0	0	5	4	Flood	
	Nearly 3 inch flood. Three Stoner Creek occurred in P	trailers we forced the e	falling on a ere evacuate evacuation	lread ed in of sev	y-satu More eral h	rated gehead somes a	ground while and bu	, forced many streatin Clark and Bourl sinesses. Most of t	ams and creeks to bon counties, the he flooding again
Edmonson County	31 0600CST	r		0	0	3	2	Flood	
	The Green Ri	ver at Brov	vnsville ag	ain ro	se ab	ove the	e flood	stage of 33 feet.	
Ohio County	31 0600CS7	ľ		0	0	3	2	Flood	
	The Rough R	iver at Dun	dee again	rose i	nto fl	ood.			
Hardin County	31 0700EST	•		0	0	3	2	Flood	
	The Rolling l	Fork River	at Boston,	rose	into f	lood th	ne seco	and time during the	month.
Powell County	31 0700EST	•		0	0	3	2	Flood	
	The Red Rive	er at Clay C	City rose ab	ove t	he flo	ood sta	ge.		
Franklin County	31 0800EST			0	0	4	3	Flood	
	The Kentuck businesses an	y River at d forcing th	Frankfort ne evacuation	rose on of	abov a few	e the house	flood es.	stage of 31 feet,	flooding several
Magoffin County	31 0800EST	•		0	0	3	2	Flood	

The Licking River at Salyersville rose above flood stage.

DECEMBER 1990

											HELLMARED	1000
			TIME NO OF ESTIMATED PERSONS DAMAGE		IATED IGE		DECEMBER	1770				
	PLACE		LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-LLED	OmbC-2-1	~-camooxo	റയാം	CHARACTER OF STORM		
L	OUISIANA											
	ssumption Parish 2 N Napoleanville	02	2130CST			0	0	3	0	Thunderstorm W	ind	
	errebonne Parish Schriever	03	0015CST			0	0	3	0	Thunderstorm W	ind	
	t. Tammany Parish Mandeville Vashington Parish	03	0445CST			0	0	1	0	Hail (1.25)		
	Bogalusa errebonne Parish	03 03	0530CST 0330CST-			0	0	6	0	Thunderstorm W	ind	
	Schriever afourche Parish	03	0730CST 0330CST-			0	0	3	0	Flash Flood		
	Northern Portion t. Charles Parish	03	0730CST 0430CST-			0	0	3	0	Flash Flood		
	. Charles Parish	UJ	0930CST			0	0	4	0	Flash Flood		

Lafourche Parish

Thibodaux

03 0600CST

1.0

45

Strong thunderstorm activity raked southeastern Louisiana during the night, bringing scattered reports of wind damage, hail, and a tornado. Just north of Napoleanville, a house was damaged by thunderstorm winds, and power lines were downed. In Schriever, thunderstorm winds destroyed one mobile home and damaged two other trailers. A weak tornado skipped across Thibodaux around sunrise, causing minor damage to 15 to 20 houses and businesses. The most significant wind damage occurred in Bogalusa when a downburst from a fast-moving, severe thunderstorm caused damage to trees, roofs, and utility lines. The thunderstorm winds collapsed a brick wall of a high school gymnasium. The gymnasium was part of a building which had been abandoned for several years, and being used for storage. The total damage estimate in the Bogalusa area was approximately \$750,000.

3

0

Tornado (F1)

0

O

Heavy rainfall affected the area from near Thibodaux, northeast across Metairie, into the Slidell area. Between 5 and 8 inches of rain fell in north Lafourche and St. Charles Parishes between the 2nd at 2300 CST and the 3rd at 0600 CST. Several homes and businesses were flooded in the Schriever and Thibodaux areas, with approximately 50 homes damaged by water in St. Charles Parish. Widespread street flooding was reported in Jefferson Parish and the Slidell area, though homes and businesses were not flooded.

Vernon Parish New Llano	18 0330CST	0	0	2	0	Thunderstorm Wind
	A severe thunderstorm produced several, causing power outages.	wind	gusts	which	ripped	large limbs off trees and toppled
St. James Parish Lutcher	18 1007CST	0	0	3	0	Thunderstorm Wind

Thunderstorm wind gusts ripped a press box off its elevated stand at a high school athletic field, and damaged several light standards.

St. Tammany Parish
8 N Covington 18 1110CST 0 0 3 0 Thunderstorm Wind

Thunderstorm winds ripped the roof off a house and destroyed a nearby barn.

LAZ001-009
All But 20 1200CSTSoutheastern 22 0600CST Severe Weather
Louisiana

A large storm system affected the south-central United States from December 20th through the 23rd. Several episodes of severe thunderstorms, associated with this storm system, affected all but extreme southeastern Louisiana, from late on December 20th through early December 22nd.

DECEMBER 1990

	TIME				NO OF PERSONS		ESTIMATED DAMAGE			DECEMBER 19
PLACE	D A	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-Lauco	Omac C. R.	4-00mr40000	COCOLIN	CHARACTER OF STORM	

LOUISIANA Cont'd

Madison Parish 6 SW Tallulah 3 SW Delta	20 20	1740CST 1740CST	0		0	2 2	0	Thunderstorm Wind Hail (1.00)
---	----------	--------------------	---	--	---	-----	---	----------------------------------

Thunderstorm wind gusts ripped large branches from trees and downed power lines.

Caddo Parrish 15 SW Shreveport 6 N Shreveport 1 NW SHV Northern Portion	20 20 21	2326CST 2352CST 0001CST	2.0	150	0 0 0	0 0 0	3 2 0	0 0 0	Tornado (F1) Thunderstorm Wind Funnel Cloud
Shreveport	21	0010CST			0	0	0	0	Funnel Cloud
Bossier Parish 5 N Bossier City 6 N Bossier City 12 NE Benton Webster Parish	21 21 21	0015CST 0020CST 0035CST	0.5 2.5	75 165	0 0 0	0 0 0	0 3 3	0 0 0	Funnel Cloud Tornado (F1) Tornado (F1)
Springhill 2 NE Springhill	21 21	0050CST 0052CST	2.0	125	0	0	3 2	0	Thunderstorm Wind Tornado (F1)

A meso-cyclone type thunderstorm spawned several tornadoes as it moved from southwest of Shreveport, near the Arkansas border and Springhill. Several funnel clouds were spotted in Shreveport as the storm moved overhead. Most of the tornado paths were through forested areas, and a majority of the damage was confined to downed trees; however, a barn was destroyed by a tornado 15 miles southwest of Shreveport, and car windows were blown out 6 miles north of Bossier City.

Calcasieu Parish Sulphur 4 S Sulphur	1216CST 1226CST	1.0	200		4 5	Thunderstorm Wind Tornado (F1)
	 	_	_			

A cluster of severe thunderstorms moved through Calcasieu Parish, in the early afternoon. Thunderstorm wind gusts downed several trees, and ripped apart large tree branches in a park in Sulphur. A tornado touched down in the community of Carlyss, south of Sulphur; destruction included one mobile home, the second floor from a house, and minor damage to 20 other houses. Several trees were toppled, and numerous branches were snapped in two.

Bienville Parish								
5 S. Liberty Hill	21	1107CST	0)	0	2	0	Hail (2.00)
Bryceland	21	1107CST	0)	0	2	0	Hail (2.00)
Jackson Parish								` ,
8 N Jonesboro	21	1120CST	0)	0	2	0	Hail (2.75)
Lincoln Parish			_		_	_	_	
8 SE Ruston	21	1135CST	0)	0	2	0	Thunderstorm Wind
East Carroll Parish								
7 NW Lake		40000000	_		ċ	_	_	TT 11 (5 00)
Providence	21	1320CST	0	ł	0	2	0	Hail (2.00)
Richland Parish		1005.000	•		_		_	ment a . Terri d
8 E Rayville	21	1325CST	0		0	4	0	Thunderstorm Wind
Winn Parish		1000.000	^		^	^	^	TT '1 (4 00)
Dodson	21	1328CST	0		0	0	0	Hail (1.00)
Jackson Parish	21	1225/2077	^		^	•	^	TT-:1 (2 00)
1 SE Chatham	21	1335CST	0	,	0	2	0	Hail (2.00)
Caldwell Parish	21	1340CST	0		0	0	0	Heil (1 50)
4 E Vixen West Carroll Parish	21	1340C31	U	'	U	U	U	Hail (1.50)
8 S Dameli	21	1345CST	0		0	2	0	Thunderstorm Wind
East Carroll Parish	41	1343631	U	'	U	L	U	I HULIOCI SWITH WILL
Roosevelt	21	1405CST	0		0	2	0	Thunderstorm Wind
Tensas Parish	LI	1405031	U	r	U	L	U	I HURE/180/III WIE
8 N St. Joseph	21	1350CST	0		0	0	0	Hail (2.00)
о 11 он зовори	-1	100001	Ū		•	•	•	(2.00)

LOUISIANA Cont'd

Madison	Parish
Waverl	V

21 1358CST

0 0 0 0 Hail (1.00)

Severe thunderstorms produced large hail in several northern Louisiana locations. Thunderstorm wind gusts removed the roof from a church east of Rayville. Other wind damage reports were confined to downed trees, power lines, and damage to outbuildings.

Tensas Parish
5 N Newellton

21 1414CST 1.0 75 0 0 3 0 Tornado (F1)

A tornado, observed by a Skywarn spotter, caused considerable timber damage, and destroyed a small number of hunting camps near Newellton.

Madison Parish									
9 S Tallulah	21	1430CST	0.5	75	0	0	2	0	Tornado (F1)
10 S Tallulah to	21	1430CST-							
7 SE Tallulah		1440CST	5.0	150	0	0	3	0	Tornado (F1)
Thomastown	21	1437CST	5.0	300	0	3	5	Ō	Tornado (F2)
1 SW Tallulah to	21	1440CST-							
4 NE Tallulah		1450CST	5.0	100	0	0	3	0	Tornado (F1)

A supercell thunderstorm, which developed over northern Tensas Parish, spawned several tornadoes as it moved north-northeast across Madison Parish. Two tornadoes were sighted, between 9- and 10-miles south of Tallulah. One tornado lifted off the ground while the other remained on the ground, and moved northeast, for about 5 miles before lifting off the ground. Damage was confined mainly to downed trees and power lines. Another tornado touched down in Thomastown, destroying three homes, damaging several buildings and injuring three persons. A weaker tornado touched down just southwest, and then northeast, of Tallulah with no significant damage to man-made structures.

Rapides Parish Western Portion Alexandria

21 1505CST

0 0 4 0 Thunderstorm Wind

Thunderstorm wind gusts snapped several large tree branches, damaged a barn, and partially collapsed the side of a building on the western side of Alexandria.

3

Lecompte

21 1515CST

0 1

0 Thunderstorm Wind

Thunderstorm wind gusts overturned a tractor-semitrailer, hospitalizing the driver.

Avoyelles Parish Center Point to Rapides Parish 4 E Deville

21 1500CST-

21 1515CST 8.0 150 0 0 4 0 Tornado (F1)

A tornado touched down along an intermittent path, from near Center Point to just east of Deville. Near Center Point, a truck was blown off the road, several outbuildings were damaged or destroyed, and numerous trees downed. In the vicinity of Deville, three mobile homes were destroyed, and ten houses damaged. There were no reported injuries.

DeSoto Parish 5 W Grand Cane Grand Cane Caddo Parish	21 21	1415CST 1425CST	1.5	200	0	0	3 0	0	Tornado (F1) Hail (1.75)
2 SW Caspiana Bossier Parish	21	1435CST	1.0	150	0	0	2	0	Tornado (F1)
3 W Ninock Webster Parish	21	1444CST	1.5	150	0	0	2	0	Tornado (F1)
Sibley	21	1515CST			0	0	0	0	Hail (1.00)

DECEMBER 1990

			TIME			NO. PER	OF SONS	EST!	MATED AGE		DECEMBE
1	PLACE	DA	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	Comp. 1.3	Chrosc.22	4-0amp0250	CROPA	CHARACTER ÖF STORM	

LOUISIANA Cont'd

Claiborne Parish 10 S Homer Red River Parish	21	1525CST	0	0	0	0	Hail (1.00)
Martin	21	1532CST	0	0	1	0	Hail (2.75)
Bienville Parish Castor	21	1553CST	0	0	0	0	Hail (1.00)
Franklin Parish Griffin	21	1554CST	0	0	0	0	Hail (0.88)

A supercell thunderstorm produced several weak tornadoes, as it moved northeast, from north of Mansfield to near Homer. The tornadoes touched down in open country, or forested areas, and damage was confined to trees and power lines. Other severe thunderstorms produced damaging wind gusts and hail, in scattered areas of northwestern Louisiana.

Tensas Parish
New Light
Madison Parish
Quimbley
2 SE Tallulah to
1 N Thomastown

21	1600CST			0	0	0	0	Hail (0.88)
21 21	1610CST 1610CST-			0	0	2	0	Thunderstorm Wind
ZI	1625CST	5.0	100	0	4	4	0	Tornado (F2)

A severe thunderstorm produced hail near New Light, and wind gusts near Quimbly, causing downed trees. The severe thunderstorm later spawned a tornado which touched down on Louisiana Highway 602, southeast of Tallulah, and ripped the roof from a house.

The tornado moved northeast and destroyed a house just north of Thomastown. Four occupants of the house were treated, with primarily minor injuries.

Tensas Parish 5 W Waterproof to 21 1625CST5 NE St. Joseph 1650CST

21 1625CST-1650CST 18.0 300 0 0 4

A strong tornado was observed by Tensas Parish Sheriff's Officers, and Civil Defense officals, as it cut a swath of damage through a heavily-forested area near the Mississippi River. A significant amount of timber was destroyed, along with several hunting camps. The width of the damage path approached 0.5-mile, at one point along its track.

0

Tornado (F3)

Madison Parish 12 S Tallulah to Mound

21 1640CST-

1700CST 10.0 150 0 0 3 0 Tornado (F1)

A tornado touched down south of Tallulah, and moved northeast, before retreating into the clouds near Mound. The tornado was observed by the Louisiana State Police.

Madison Parish 10SW Delta to 5SSW Delta

21 1720CST-

1730CST 5.0 250 0 0 4 0 Tornado (F2)

A strong tornado touched down in extreme-eastern Madison Parish, near the Mississippi River, destroying an unoccupied house. The tornado was observed and filmed by storm spotters, located at the base of the Mississippi River Bridge in Vicksburg, MS. The tornado was apparently spawned by the same thunderstorm which had spawned a strong, long-tracked tornado in Tensas Parish, approximately 30 minutes earlier.

Sabine Parish 3 SSE Florien Natchitoches Parish Bellwood

21 1745CST 0 0 0 0 Hail (1.00) 21 1801CST 0 0 0 Hail (1.00)

Severe thunderstorms produced hail in a few locations of northwestern Louisiana.

		TIME			NO.	OF SONS	EST IN	AATED AGE		DECEMBER 1990
PLACE	O A	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K	OTTOC - Z-	4- 00 m.00:00	CECOEN	CHARACTER OF STORM	

LOUISIANA Cont'd

Madison Parish Altoona	21	2015CST	0	0	3	0	Thunderstorm Wind
Franklin Parish East Portion Madison Parish	21	2025CST	0	0	2	0	Thunderstorm Wind
2 NE Tallulah	21	2040CST	0	0	2	0	Thunderstorm Wind

A barn was destroyed by wind gusts near Altoona; trees and signs were damaged, or destroyed, in eastern Franklin Parish and Tallulah.

Tensas Parish
2 S Somerset
Madison Parish
2 S Mound

22 0125CST Hail (0.88) 22 0140CST 0 0 2 0 Thunderstorm Wind

Nickel-size hail was reported near Somerset, and thunderstorm wind gusts downed a large billboard and several trees near Mound.

West Feliciana Parish

4 NW

St. Francisville

22 0330CST

4 Thunderstorm Wind

Thunderstorm wind gusts destroyed one mobile home, and severely damaged a house; one occupant of the mobile home was injured.

Tensas Parish Eastern Portion

0230CST-0730CST 23

0 0 0 Flash Flooding

Rainfall of 6 to 10 inches during the previous 72 hours, saturated the soil and raised levels of drainage bayous and creeks. Intense rainfall, between 0000 CST and 0300 CST, caused numerous inundated roadways in the eastern portion of the parish. A nursing home in Newellton evacuated patients due to rising water.

MAINE

MEZ003-004-007 008-010-011-013 014

Coastal Maine MEZ003-004-007 008-010-011-013 Coastal Maine

03 04	Evening- Evening	0	0	6	0	Coastal Surge
03 04	Evening- Evening	0	0	?	0	High Winds

Heavy rain across coastal Maine coincided with the abnormally-high spring tide, and caused widespread damage along the entire coastal sections of the state. The combination of these forces resulted in approximately \$1 million damage, such as, beach erosion, numerous washed-out and flooded roadways, damaged wharfs, and damaged boats. The area most affected was Camp Ellis in Saco, where a two-story house toppled into the ocean. The house was located at the corner of Riverside, Eastern, and Northern Avenues. Wind and waves pummeling the sea wall along Long Sands Beach, in York, threw driftwood and softball-size rocks across the road.

MEZ001-002-003 005-006-007-009 010-012 Central and Northern Maine

Morning-04 Night Heavy Snow

Six to 10 inches of heavy snow fell over central and northern Maine; 16 to 18 inches in the mountains created slippery roads, some school closures, and widely-scattered power outages.

	7	TIME			NO. PER	OF SONS	EST II	MATED AGE		DECEMBER
PLACE	DAG-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K	Ortizo C. Z. H	4-20m 0020 0	CEODO	CHARACTER OF Storm	

MAINE Cont'd MEZ006-007-009 010-012-013 Mountains, Foothills, and Interior Maine

15 Midday 16 Night 0 ? Heavy Snow

Heavy snow fell over the area, as a low-pressure system developed along the coast of the United States to Connecticut (near Bridgeport) early on the 15th. This low underwent rapid intensification as it crossed the Gulf of Maine, on the 15th. A low aloft followed this surface pattern, and produced another batch of snow on the 16th. Snowfall totals ranged from 6 inches over the interior to 14 inches in some of the mountain locations. There were numerous automobile accidents, with some fatalities, during this snow event.

MEZ001-002-003-004-005-006-007-008-009-010-011-013-014 Statewide

21 Morning ? ? Freezing Rain

A large ocean high-pressure system over the western Atlantic, circulated moisture over the state. As this high moved east on the 21st, a coastal frontal pattern moved from the southeastern United States to northern Maine. Freezing rain occurred statewide, resulting in numerous automobile accidents.

MEZ001-002-005 Northern Maine

24 Morning-? Afternoon Heavy Snow

A low-pressure system intensified, as it moved from the Tennessee Valley to southern New England, on the morning of the 24th. The low then quickly moved across the Gulf of Maine in to the north Atlantic; as a result, 6 to 9 inches of snow fell across northern Maine.

Penobscot County Lincoln

? n 0 0 Flood 28 Morning

An ice jam at the Bangor Hydro-Electric Company Dam, in West Enfield, caused minor flooding on Mohawk and Dodlin Roads in Lincoln.

MARYLAND AND D.C.

Cecil County

21 1800EST-2100EST

0 3 0 Fog

Heavy fog was the apparent cause of an 11-car pileup on Interstate 95 at approximately 1850 EST. Three people were transported to hospitals as a result of automobile injuries.

MDZ005-009

1800EST-28 1300EST

Heavy Snow

The first heavy snow of the winter deposited a foot or more in many places. Representative storm totals included: Cumberland and Frostburg 13 inches, Westernport 12 inches, Williamsport 11 inches, Darnestown 7 inches, and Baltimore-Washington International Airport (BWI) 5 inches.

MDZ007

30 0700EST-1500EST

13 5 0 Fog

Dense fog over central and western Maryland, was a contributing factor to a chain-reaction traffic accident near Frederick (about 1035 EST), involving at least 10 vehicles. Thirteen people were treated for injuries, two of whom were hospitalized.

Anne Arundel 31 County

0000EST-0300EST

0 5 0 **High Winds**

A strong cold front caused gusty winds which downed many trees, caused widespread power outages, and damaged the roofs of several houses. Several cars were also seriously damaged by falling trees. Winds gusted to 50 knots (56 mph) at Baltimore-Washington International Airport (BWI), as the cold front passed.

DECEMBER 1990

		TIME			NO.	OF SONS	EST II	AATED AGE	
PLACE	DAO-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KI LLED	OHOOC LEE	4-50mm00x0	ഗഹാഹ	CHARACTER OF STORM

MASSACHUSETTS

MAZ002-003-007-008-009 04 0900EST-1400EST

0 0 6 0 Coastal Flood

Southern and southeastern gales combined with an unusually high astronomical tide, produced significant flooding along south-facing coasts of Massachusetts. Most severely affected were the southern coast of Cape Cod between Harwich and Barnstable where up to 100 residents were evacuated from their homes, and Provincetown at the tip of the Cape. Tides reached 2- to 3-feet above normal, flooding many roads and basements. In Provincetown, there was serious structural damage as well as flooding. Property damage was estimated at around \$600,000. A well-known restaurant there was severely damaged. Wave battery eroded an average of 4 feet of land, along the Cape Cod National Seashore Beaches. Flooding of shore roads and beach erosion, also occurred on Martha's Vineyard and Nantucket Islands. The peak wind gust at the National Weather Service at Chatham was 58 mph. North of Boston, there was flooding and beach erosion along south- and southeast-facing coastlines. A 100-foot section of sea-wall collapsed in Marblehead, resulting in damage to three properties. Elsewhere, near Boston, and south of the city, there was flooding of coastal roads and causeways around the time of high tide; however, there were no damage reports.

MAZ002-004-005

28 0300EST-0900EST

0 0 0 0 Heavy Snow

The first significant snow of the season accumulated from 6 to 8 inches in the Springfield area, eastward across southern Worcester County to northern Bristol County. The morning commute was disrupted with numerous minor accidents.

MAZ002-003-004-

31 0230EST

0 0 4 0 High Winds

A period of strong and gusty northwestern winds accompanied a cold front, which raced eastward across the state. The following peak gusts were recorded at official National Weather Service and military sites: 56 mph at Worcester, 53 mph at Boston, 78 mph at Blue Hill Observatory in Milton, 52 mph at Falmouth, and 46 mph at Chatham. At Logan International Airport in Boston, the wind spun a large jet aircraft into a wall, and destroyed part of the roof of a freight building. Debris broke windows of several automobiles parked nearby. In Worcester, an 800-pound prefabricated panel was blown from the 15th floor of a twenty-four-story building. A few scattered power outages were reported.

MICHIGAN

MIZ001-004-006-007 011-012-043-045-050 053-076-079-083 Upper Peninsula Northern Lower and Southwestern Lower Peninsula

05 0400EST

0 0 3 0 Blizzard

The first December snowfall in Michigan was the most intense storm of the month and season thus far. A fairly strong low-pressure system moved northeast, across Lake Michigan, late in the afternoon on Monday, December 3rd. From there, the storm moved slowly northeast, crossing northern Lake Huron during Tuesday morning, but not moving east of Lake Huron until late Tuesday afternoon. As a result, heavy snow fell in 43 of Michigan's 83 counties. Light snow began falling over southern-lower Michigan before sunrise on Monday. Snow began falling over the upper Peninsula by noon. Heavy snow with gale-force winds began blowing across most of northern-lower and upper Michigan by early afternoon. The snow ended as flurries, in most areas, by around 1500 EST on Tuesday, December 4th; however, the northwestern winds blowing across the widest part of Lake Michigan during Tuesday afternoon, caused a lake-effect snow band about 20-miles wide, remain nearly stationary from near Holland (on the Lake Michigan shoreline in northwestern Ottawa County), southeast across Battle Creek, to near Coldwater, in central Branch County. This snowbank developed early Tuesday morning and finally dissipated around 1900 EST that evening. Snowfalls in the snow band ranged from 8 to 14 inches; 11 inches on average. Over the main storm snow area, 6 to 10 inches were common across northern-lower Michigan, with two areas of 12 inches. One snow band occurred over

DECEMBER 1990

		TIME			NO.	OF	ESTI!	ATED	
PLACE	D A E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K L	CHACLE.	4-88m1003810	NTORO	CHARACTER OF STORM

MICHIGAN Cont'd

northeastern-lower, and the second over the Leelanau Peninsula, north of Traverse City. The upper peninsula had the most snowfall; 6 to 15 inches in most areas, with the greatest reported snowfall from Champion, (in western Marquette County) where 20 inches were reported. Due to high winds and heavy snow, considerable drifting occurred. This caused many school closings in northern-lower and upper Michigan on Tuesday. There were many reports of winds between 30 and 40 mph with frequent gusts near 50 mph. Ontonagon reported the highest gust of 64 mph. All airports in the area were closed and about 80,000 customers lost power across Michigan, during this blizzard. Four-thousand calls were made to the AAA Motor Club for road assistance; over 100 auto accidents were reported. One accident was fatal to a 56-year-old man, near Traverse City, when he crashed Tuesday morning around 1045 EST. The high winds caused some building damage near the Lake Huron shoreline. This included bricks blown off a building wall into the plate glass of the adjoining building. After all was done late on Tuesday evening, this storm will remain as one of the more memorable storms of this season.

MIZ063 Eastern Upper Peninsula 15 1000EST 0 0 0 Heavy Snow

Snow began falling over the western upper peninsula Saturday morning, then spread to northern-lower Michigan early in the afternoon. The snow ended over most of the area by 1000 EST that evening. The snow ended along the Lake Huron Shoreline areas around 1500 EST, Sunday morning. Eight inches was the maximum reported snowfall with this storm; this occurred at Vanderbilt, in northern Otsego County. No significant snowfall was reported, south of a line from Ludington to Saginaw. North of this line, 2 to 4 inches was common for both the upper peninsula and northern-lower Michigan.

MIZ069-073-080-083 Eastern Upper Peninsula

17 0700EST 0 0 0 Heavy Snow

Light snow began falling over the western-upper peninsula during Monday morning, spreading across the remainder of the upper peninsula during the afternoon. Snow became heavy during the evening hours, then tapered to light snow around midnight. The snow ended completely by 1000 EST on Tuesday, December 18th. Snowfalls of 6 to 10 inches were common across most of the central- and eastern-upper peninsula. Southern Schoolcraft County reported the heaviest snowfall; 12 inches. Numerous fender-bender-type accidents were reported; but no injuries or major property damage occurred.

MIZ004-005-009-011 018-024-027-031 Southern Lower Peninsula

23 0000EST 0 0 0 0 Heavy Snow

Snowfalls of 3 to 8 inches were reported in about 32 hours. The snow fell in two time periods, the first from just after 0000 EST on the 23rd, to about 0800 EST on the 23rd; then the second period of snow began around 1800 EST on the 23rd, continued past midnight, ending about 0800 EST on the 24th. The heaviest snow occurred from the western suburbs of Detroit, west to Ann Arbor, in central Washtenaw County. This area reported about 8 inches of snow. Many minor automobile accidents occurred with this storm; however, no serious injuries were reported.

MIZ003-004-013-055 25 1000EST Northwestern Lower Southwestern Lower The combinati 0 0 ? 0 Heavy Snow

The combination of a strong cold front and lake-effect, caused the Grand Rapids area and the surrounding suburbs of southwest-lower Michigan, plus a small part of western Benzie County in northwest-lower Michigan, to have heavy snow, strong winds, and temperatures in the teens. This resulted in wind child temperatures from -20 to -30° during Christmas Day. Most of the snow fell during the late morning and early afternoon. Snow fell at the rate of 2 inches in 1 hour in some places. Grand Rapids reported 6.7 inches of snow during this storm. This is the all-time-record Christmas (one day) snowfall for the Grand Rapids area. Many traffic accidents occurred across the area, with several multiple-vehicle accidents reported. There were many reports of significant damage to personal property, and several reports of injuries in these accidents.

MIZ001-005-007-012 018-021-027

Extreme Southern 28 2200EST 0 0 4 0 Flooding

DECEMBER 1990

		TIME			NO. PER	SONS	EST I	ATED	
PLACE	DAG-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KILLE	CHINCLE.		woown	CHARACTER OF STORM

MICHIGAN Cont'd

Heavy rains of 1 to 2.50 inches, fell in a little over 2 days. This fell on a 3- to 9-inch snow cover. The combination of the heavy rain, melting snow, and frozen ground caused most of the streams and rivers to go over their banks in southern-lower Michigan. On some of the larger river systems like the Grand River, at Comstock Park, reached 1.4 feet above flood stage on the 30th. The Thornapple River at Hastings reached a peak level of 7.8 feet at 1100 EST on the 29th. This is 0.8 feet above flood stage. The St. Joseph River had flooding along most of its length. Three Rivers reached 7.4 feet on the 29th; 1.4 feet above flood stage. At Niles, the St. Joseph reached 14 feet; 3 feet above flood stage on the 29th. The River Raisin, which flows through southeastern-lower Michigan, was 2.8 feet above flood stage at Tecumseh on the 29th, and 2.8 feet above flood stage at Adrian on the 30th. Monroe County, in southeastern-lower Michigan, and Kent, Ottawa, and Berrien counties in southwestern-lower Michigan, had the most serious problems with flooding. In many of these areas, some less-traveled roads had minor cave-ins; quite a few roads were blocked in several places, due to water flowing over the them. A Berrien County apartment complex was threatened with one of the cave-ins for a period of time; this was caused by a small stream undermining a parking lot close to the complex. Several dozen families had to evacuate their homes. In places, water was 3-feet high on some buildings. With all this precipitation, most of the damage was minor; mostly flooded-basement cleanups and road repairs.

MINNESOTA

MNZ018-109-South Central-Southeast MN

02 1600CST-03 1700CST

0 0 ? 0 Blizzard

A major winter storm lifted northeast from the Oklahoma Panhandle, late evening on the 2nd, to Lake Michigan by late afternoon, on the 3rd. At the height of the storm, heavy snow accompanied with thunder occurred during the morning of the 3rd in the extreme southeastern corner, and deposited over 1 foot of snow. Northwestern winds gusting to 35 to 48 mph in the morning and afternoon on the 3rd, caused blinding whiteout conditions. Many schools were closed and vehicles littered roadsides, with numerous accidents reported. Snowfall amounts of 6 inches or more fell southeast of the line, from Lake City-Owatonna to near Bricelyn. A swath of snow, 1 foot or more, fell southeast of a line from Winona-Elgin to near Spring Valley. Thirteen inches of snow was reported at Lanesboro, 14 inches near Winona, and 15 inches at Hokah.

MNZ015-019 Southwestern-East-Central to Southeastern

14 1700CST-15 1100CST

0 0 ? 0 Heavy Snow

A mixture of precipitation in the form of freezing rain, sleet, and snow began during the late afternoon in the southwest, and slowly spread northeast, across the southern-third of the state. Before changing completely to snow, roads became glazed, and contributed to at least two traffic fatalities. By late morning on the 15th, a 50-mile-wide band of snow, 6 inches or more, was deposited over the southern-third. The northern extent of the snow band extended from Pipestone-Stewart to Stillwater. Some of the heavier amounts fell over southern and eastern portions of the Twin Cities metropolitan area, with Burnsville and Oakdale reporting 7 inches. Six to 8 inches of snow was reported from Fairmont and Blue Earth, through the Waseca and Owatonna area.

MNZ018-109 South Central-Southeastern 16 1700CST-17 0900CST

0 0 ? 0 Ice Storm

A mixture of freezing rain, sleet, and snow spread a coating of ice across south-central and southeastern Minnesota overnight, causing treacherous driving and walking conditions.

MNZ019 Southeastern

17 0500CST

0 0 ? 0 Heavy Snow

A 40-mile-wide band of snow, 6 inches or greater, fell south of a line from Altura to Lyle in the extreme southeast. The combination of ice and snow on area roadways caused several car accidents. At least eleven minor injuries were attributed to treacherous driving conditions. Two area school buses were stranded for about an hour, on lesser traveled roads.

DECEMBER 1990

		TIME			NO.	OF SONS	ESTI!	ATED AGE		DECEMBE
PLACE	DA)	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KTLLEO		4-89m10039-5	CROPN	CHARACTER OF STORM	

MINNESOTA Cont'd

MNZ001-011 Northern-Western Central

19 1300CST-20 1000CST

0 0 0 0 Heavy Snow

Snow began to fall over the northwest by early afternoon on the 19th, and fell heavily during the night into the early afternoon on the 20th. By midmorning, a swath of snow, 6 inches or more, was deposited over much of the northern one-half, or north of a line from Elbow Lake-Garrison, to near Two Harbors. The far northwestern corner received less than 6 inches, but a small area over the north-central area received over 1 foot with International Falls reporting 14.4 inches.

MNZALL

21 0600CST-22 2300CST

0 0 0 0 Extreme cold

Snow developed over the south during the morning of the 21st and began in the north by noon. Snow, accompanied with thunder, moved from south-central through east-central parts of Minnesota. Two to 4 inches of snow fell in about a 3-hour period over parts of the Twin Cities Metropolitan Area around midday, snarling holiday traffic. Heavy snow and reduced visibilities closed the International Airport for about 30 minutes, interrupting flights for thousands of holiday travelers.

Northeastern sections received snow during the night and through most of the day on the 22nd. Snowfall amounts greater than 6 inches, fell east of a line from Baudette-Hibbing and near Duluth. Eleven and four-tenths inches was reported at Floodwood, 10.5 inches at Lutsen, and 10 inches near Tower.

Arctic high-pressure built in rapidly behind the snow-producing system. Increasing northwestern winds, combined with air temperatures below zero, caused wind chills from -40 to -65° over most of the state by early in the day on the 22nd.

MISSISSIPPI

Tallahatchie County 5 S Charleston

03 0115CST

0 0 2 0 Thunderstorm Winds

Several trees were downed by winds across Highway 35.

Pearl River County Poplarville

03 0615CST

0 0 5 0 Thunderstorm Winds

Numerous trees and power lines were blown down. One shop was destroyed and part of the roof was blown off a school building. Several houses sustained roof damage.

Harrison County

03 0645CST

5 5 0

Thunderstorm Winds

Eleven miles southwest of Howison, in the Riceville Road area, three mobile homes were destroyed. Five people were injured in the mobile homes; two seriously. Midway between Howison and Saucier, a porch was blown off a house and another sustained roof damage. Numerous trees were downed across the northwestern part of the county.

Green County Neely

03 0650CST

0 0 4 0 Thunderstorm Winds

One barn was totally destroyed, and numerous trees and power lines were blown down.

Perry County Beaumont

03 0700CST

0 0 5 0 Thunderstorm Winds

Numerous trees were blown down with several falling on houses. Several sheets of tin were blown off the roof of a house.

DECEMBER 1990 NO OF PERSONS ESTIMATED DAMAGE TIME LENGTH OF PATH WIDTH PATH LOCAL D CHARACTER **PLACE** STANDARD STORM (MILES) (YARDS) MISSISSIPPI Cont'd Green County Sand Hill 03 0720CST 0 Thunderstorm Winds One unfinished farmhouse was destroyed, and several homes reported roof damage. Several acres of timber were damaged. Numerous power poles and lines were blown down. George County 6 SW Agricola 03 0730CST 0 Thunderstorm Winds A mobile home was so completely destroyed, the wheels could not be found; one person was seriously injured. George County Agricola 03 0735CST Thunderstorm Winds A mobile home was totally destroyed and subsequently spread over 3 acres. A woman in the mobile home was carried 200 feet by the wind, and seriously injured. George County 03 0745CST 3 Thunderstorm Winds Shipman A mobile home was destroyed, causing minor injuries to three people. **Hinds County** Raymond 18 0720CST 0 High Wind One large oak tree was blown down. **Hinds County** 3 N Jackson 18 0746CST 3 **High Wind** The roof was blown from a building, and several trees were blown down. **Hinds County** 4 NE Jackson 18 0800CST 3 High Wind A large tree was blown onto a house, causing major roof damage. Lauderdale County Meridian Airport 0 18 1037CST 0 0 High Wind (G59) (MEI) The National Weather Service in Meridian, recorded a wind gust of 68 mph with the passage of a cold front. No property damage was reported. Monroe County **Flooding** Widespread flooding occurred along the Tombigbee River and its tributaries. Numerous roads throughout the county were damaged. Several bridges were badly damaged and closed. One hundred people were evacuated from their homes in the Bigbee and Becker Bottom communities. Seventeen homes reported flood damage. Flooding on the Tombigbee River washed out a natural gas line near Bigbee, and 12,000 customers were without service.

0

There was minor flooding of small creeks and secondary roads.

0

3

0

Flooding

20-21

Pontotoc County

PLACE

TIME

D. LOCAL LENGTH WIDTH L. J. D. C. CHARACTER OF STORM

(MILES) (YARDS)

DECEMBER 1990

DECEMBER 1990

DECEMBER 1990

MISSISSIPPI Cont'd

Yazoo County Myrleville

20 1503CST

0 0 3 0 Thunderstorm Winds

Numerous trees were downed by winds in, and around Myrleville. Trees blocked Highway 433 southwest of Myrleville and on Myrleville Road north of town. Twenty-four hours after the storm, road crews were still cleaning up debris.

Copiah County Hinds County 7 SW Hazelhurst

20 1528CST-1700CST 28.0 60 0 0 3 0 Tornado (F0)

This was a small, slow-moving tornado even though it stayed on the ground for a long distance. The tornado touched down 7-miles southwest of Hazelhurst, and moved north-northeast from 220° at about 20 mph. The tornado moved out of Copiah County, into Hinds County, at a point 7-miles southwest of Terry at approximately 1627 CST; the tornado dissipated 5 miles west of Byram at 1700 CST.

This was a weak tornado, causing very little damage. Several trees were downed along the tornadoe's path in both Copiah and Hinds counties. A storage shed was destroyed 5 miles northwest of Terry, in Hinds County, and numerous tree limbs were blown from trees in Copiah County. A local television crew filmed the tornado in southeastern Hinds County.

Attala County

20 1635CST

0 0

0

Thunderstorm Winds

Several trees and power lines were downed in extreme southwestern Attala County. Traffic was diverted on several county roads, until trees could be removed.

2

5

Itawamba County

21-24

0 0

0 Flooding

Widespread flooding occurred along the Tombigbee River and its tributaries. More than 40 roads and bridges were severely damaged due to the flooding; estimated repair costs were \$350,000.

Chickasaw County

21 0100CST-0400CST

0 0

0 Flooding

There was minor flooding of low agricultural land, and secondary roads, from small creeks throughout the county.

Sunflower County Sunflower

21 1441CST

0 :0

0

Thunderstorm Winds

Numerous trees and power lines were downed and several homes sustained roof damage. The windows of several buildings and cars were broken out by these winds, which were estimated at 70 to 75 mph.

5

LeFlore County Swiftown

21 1455CST

0 0

0

Thunderstorm Winds

Several homes sustained minor roof damage, with numerous trees and limbs downed.

Leflore County
5 S Morgan City to
1 SW Greenwood

21 1510CST-1542CST

16.0

300

0

0 Tornado (F2)

The tornado touched down 4.5 miles south of Morgan City, and stayed on the ground 16 miles, to 1 mile southwest of Greenwood. The tornado tracked mostly across a sparsely-populated area, amd caused considerable damage in a subdivision, 3 miles east of Morgan City. Several houses had partially removed roofs, and one mobile home was totally destroyed; several cars and trucks

PLACE

TIME

LOCAL
STANDARD
PATH
(MILES)

PATH
(YARDS)

DECEMBER 1990

MISSISSIPPI Cont'd

were damaged. To the north and southwest of the Rising Sun Community, 3.5 miles north of Sidon, several homes sustained major roof damage. There was considerable damage to several farm implement sheds and several cotton trailers. A Pivic irrigation system was severely damaged. Two mobile homes were destroyed and a school 1.5-miles southwest of Greenwood reported minor roof damage and window destruction. Numerous trees and power lines were downed along tornado path.

Humphreys County 3 S Belzoni to 3 NE Belzoni

A tornado touched down 3-miles south of Belzoni, and was tracked to 3-miles northeast of town. The total path length was 5.25 miles; at its widest point, it was 200 yards. Numerous trees were downed along the path. In a small subdivision 2-miles east-southeast of Belzoni, six houses were badly damaged, mainly the roofs. A large oak tree fell on one of the homes, crushing a man. One small trailer was destroyed. (M48H)

Yazoo County Valley

21 1540CST 0 0 0 Thunderstorm Winds

Traffic was blocked along Highway 7 by downed trees.

Carroll County Jefferson

21 1610CST 0 0 4 0 Thunderstorm Winds

Several trees were downed and two homes were slightly damaged by winds.

Grenada County 2 ESE Holcomb to 5 NE Holcomb

21 1620CST-1627CST 3.5 440 0 0 5 0 Tornado (F3)

This tornado touched down 2-miles east-southeast of Holcomb, in a wooded area. It cut a clean path through the trees, snapping off or uprooting many of large size. As it moved northeast, it caused major damage to five well-constructed houses and blew down several more large trees. After crossing Highway 7, it struck a well-constructed, large brick home causing almost-complete destruction, and completely destroyed a farm-implement building. Debris from the house and building was carried a mile and a half to the northeast. The tornado then moved into a wooded area and again snapped off, or uprooted, numerous trees.

Holmes County 2 E Lexington

21 1628CST 0 0 2 0 Thunderstorm Winds Funnel Cloud

Several trees were downed; a funnel cloud was spotted; however, it did not touch down until the storm moved further northeast.

Holmes County and Carroll County 0.5 NE Bowling Green to 5 NE Vaiden

21 1650CST-1719CST 20.0 880 1 15 6 0 Tornado (F3)

The tornado touched down 0.5-mile north of Bowling Green (in Holmes County) moving northeast, from 230° at 40 to 45 mph. It moved from Holmes County into Carroll County at a point 4.5-miles northwest of West. At a point 4.5 miles southeast of Wiltshire, the tornado began a more northerly-track, from 210°. Two miles southwest of Vaiden, it began turning toward the northeast from 220° to 0.75-mile north of Vaiden. It then moved from 240° from where it lifted, 5 miles northeast of Vaiden.

DECEMBER 1990

		TIME			NO. PER	OF SONS	EST II	MATED AGE		DECEMBER
PLACE	Đ	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-LLLED		4-0mm3020	CECOAN	CHARACTER OF STORM	

MISSISSIPPI Cont'd

This was a very strong tornado, from the point it touched down in Holmes County until it crossed Interstate 55, about 5-miles southwest of Vaiden, it traveled through mostly wooded-and sparsely-populated areas. It cut a distinct path through the wooded areas which varied from 0.25- to 0.50-mile wide. Thousands of trees were snapped off or blown down, and two barns were damaged. As the tornado crossed Interstate 55, several cars were blown off the highway, and a tractor-semitrailer overturned. As it moved toward Vaiden, five homes were severely damaged and three mobile homes totally destroyed. The tornado entered the extreme southwestern corner of Vaiden at 1712 CST, and at this point it was 0.50-mile wide. It practically leveled everything in its path, as it moved out of the northern portion of Vaiden. Fifty-five homes and mobile homes were destroyed, 29 homes received major damage, and 60 homes minor damage. Fifteen people were injured in Vaiden, and one 12-year-old girl was killed in a mobile home to the northeast of Vaiden. The tornado continued its path, to 5-miles northeast of Vaiden. It downed numerous trees and caused major damage to two homes. (F12M)

Gre	mad	la C	ounty Plant
1	SE	Tie	Plant

21 1658CST 2.0 100 0 0 5 0 Tornado (F1)

One weakly-constructed home was destroyed, and five homes sustained roof damage. The roof was blown off a 40- by 80-foot storage building. A large factory building roof was damaged and large metal doors blown in. Numerous trees were snapped in two by the winds.

Carroll County 5 SW Vaiden Carroll County Vaiden Montgomery County 5 SE Winona Warren County Le Tourneau	21 21 21 21	1705CST 1710CST 1718CST 1730CST	0 0 0	0 0 0	0 0 0	0 0 0	Hail (1.75) Hail (1.75) Hail (1.75) Hail (1.25)
Warren County Vicksburg		1744CST		_	0	0	•
v icksburg	21	1744031	0	0	U	U	Thunderstorm Winds (G61)

Seventy mph winds were reported by the Mississippi Emergency Management Agency.

Warren County 9 SW Vicksburg

21 1752CST

0 0 0 0 Hail (1.75)

Golf ball-size hail was reported at the Vicksburg Airport.

Warren County 4 SW Oakridge to 1 NE Oakridge

The tornado touched down 4.25-miles southwest of Oakridge traveling to the northeast, and through the community of Oakridge, to 1-mile northeast of Oakridge. Several homes along the path sustained roof damage. One storage shed was totally destroyed. One church had much of the roof peeled off. Several mobile homes were blown off their foundations. Numerous trees were snapped off or blown down.

Webster County

21 1800CST

0 0 0 0 Thunderstorm Winds

Several trees were blown down in northwestern Webster County.

Calhoun County Slate Springs

21 1800CST

0 0 0 0 Thunderstorm Winds

Numerous trees were blown down.

DECEMBER 1990 NO OF PERSONS ESTIMATED DAMAGE TIME LENGTH OF PATH WIDTH OF PATH LOCAL CHARACTER **PLACE** STANDARD STORM Ė (MILES) (YARDS) MISSISSIPPI Cont'd Pontotoc County 8 W Pontotoc to W Pontotoc 21 1805CST 200 0 0 Tornado (F1) The tornado touched down 8-miles west of the center of the city of Pontotoc, and moved east-southeast for 1 mile. The tornado destroyed one mobile home and blew the roof off another. Several large trees were uprooted, or twisted off. Grenada County 0.5 NE Elliot to 21 1830CST 2 NE Elliot 1.5 70 5 0 Tornado (F1) Numerous trees were blown down; some of them fell on homes, causing extensive roof damage. **Hinds County** 5 NW Jackson 5 21 1845CST O O Thunderstorm Winds Strong winds damaged a 400,000-square-foot distribution building along Interstate 220. Much of the southern side of the building was torn off, and a small portion of the roof was removed. Lee County 1900CST-2200CST Tupelo 21 2 Flash Flooding Several streets were flooded in, and around, the city of Tupelo. Depths to 3 feet were reported in some of the streets. 1900CST-2030CST Chickasaw County Thunderstorm Winds There were several reports of tree and roof damage scattered across Chickasaw County. Calhoun County 5 21 1910CST Vardaman Thunderstorm Winds Several trees were blown down and four houses sustained roof damage. Damage was estimated at \$60,000. Chickasaw County 21 1915CST 2 0 2 S Houston Thunderstorm Winds Several large trees were uprooted and downed across Highway 15. Madison County 5 NNW Canton to 1 NW Loring 21

21 1932CST-1948CST 11.0 880 0 0 6 0 Tornado (F3)

The tornado touched down 5-miles north-northwest of Canton, or just southwest of Highway 16 and just west of Interstate 55. At this point, it blew down several large trees and caused major damage to the roof of a house. The tornado tracked to the northeast, crossed Interstate 55 about 3-miles south-southwest of Way. After crossing the interstate it then damaged six houses on Brown Road. The tornado intensified as it approached Way Road and completely destroyed a mobile home, caused major damage to a well-constructed house, totally destroyed three farm implement buildings, and two grain elevators. At a point approximately 1.2-miles south of Way, the tornado appeared to change direction from 210° to 230°. It moved across open land and then into a wooded area and cut a path from 0.25- to 0.50-mile-wide through the trees. It struck a church camp 5-miles southwest of Loring, and caused about \$1 million damage to buildings and property. At the church camp the path was at least 0.5-mile wide, and was snapping off, or blowing down nearly every tree in its path. Just northeast of the church camp the tornado completely leveled a wooden-frame house. The tornado crossed Highway 51 about 3-miles southwest of Loring, and appeared to be weakening. The path had reduced to 0.25-mile, but the tornado was still blowing down trees. It tracked to about 0.75-mile northwest of Loring, then lifted or dissipated. Most of the damage over the last 2.5 miles occurred mainly to trees.

_______ DECEMBER 1990

		TIME			NO.	OF SONS	ESTII DAM/	MATED AGE] DECEMBER 1990
PLACE	D	LOCAL STANDARD	LENGTH OF PATH	WIDTH OF PATH	Ķ	I N U	-02/Op.up	NTOWO	CHARACTER OF STORM	
	-		(MILES)	(YARDS)	Ē	Decemb	ER Y	S		
MISSISSIPPI Co	nt'd			-		I		!	-	,
Lafayette County	21	1945CST- 2330CST			0	0	4	0	Flash Flooding	
	this	ere were nur s period. Un streets.	merous reprban and st	orts of sec reet floodi	onda ng oo	ry roa	d and d in O	lowlan xford v	d flooding across the with up to 2 feet of	ne county during water in some of
Chickasaw County	21	1945CST- 2330CST			0	0	4	0	Flash Flooding	
	He affe	avy rainfall ected were s	caused fla secondary	sh floodin roads and l	g of ow a	small gricul	creek tural l	s throu and.	ghout the county.	The areas most
Prentiss County	21	1945CST- 2330CST			0	0	3	0	Flash Flooding	
•	Sev	veral second	ary roads	flooded acı	ross t	he co	unty.			
Tishomingo County	21	1950CST			0	0	3	0	Thunderstorm W	inds
	The bet	e power cor ween Burns	npany rep ville and lu	orted trees ika, causin	dow g pov	med o	n pow utages	er line to som	es in the town of The 2,000 customers	lishomingo, and for 1 to 2 hours.
Tishomingo County	21	2000CST- 2300CST			0	0	3	0	Flash Flooding	
	The brie	e southern po dges were te	ortion of the emporarily	e county re closed due	eporte to h	ed sev igh w	eral co /ater.	ounty-n	naintained roads we	re flooded. Two
Attala County Zama	21	2025CST			0	0	2	0	Thunderstorm W	'inds
	Nu	merous trees	s and powe	er lines we	re bl	own d	lown.			
Winston County Louisville	21	2115CST			0	0	5	0	Thunderstorm W	inds
	Nu: just	merous tree t north of L	limbs and ouisville, v	Christmas where wind	deco is we	oration ere est	ns were imated	e blow: l at 52	n down. Trees fell knots.	on three homes
Chickasaw County	21 22	2330CST- 1130CST			0	0	5	0	Flooding	
	The	ere was wide inty. Some	espread flo roads and	oding of co culverts re	reeks xeive	, seco	ndary ior dai	roads, mage d	and low agricultura ue to the flooding.	l land across the
Lee County Tupelo	22- 23				0	0	3	0	Flooding	
	stre	wn Creek in tets and brid te temporari	ges. Two	illed out o businesses	f its l susta	banks ined 1	, howe ninor o	ver, m lamage	ost of the flooding due to flooding. S	was confined to everal roads had
Warren County 9 S Vicksburg	22	0105CST			0	3	5	0	Thunderstorm W	inds

One mobile home was blown from the foundation and flipped on its side into some trees; three people were injured. None of the injuries were serious; mainly cuts and bruises. Another mobile home was pushed off its foundation, but was not badly damaged. One other mobile home had a portion of the roof blown off. Several large tree limbs were blown from trees. A church and several other homes were damaged; none seriously.

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME LENGTH OF PATH LOCAL MIDIH CHARACTER PATH STANDARD PLACE SŤÖRM F (MILES) (YARDS) MISSISSIPPI Cont'd Warren County 22 0300CST 5 Flash Flooding Vicksburg 0 Four inches of rain fell in Vicksburg in 2 hours, and several houses in the Hamilton Heights Subdivision had water in them. Numerous streets were flooded. Lincoln County
7 SW Brookhaven to
5 SW Brookhaven 22 0915CST 2.0 80 0 0 Tornado (F1) The tornado touched down about 0.5-mile south of Highway 84 in a wooded area. It blew down several trees, then struck a barn and a house along the southern side of Highway 84. The roof of the house was completely removed and blown across the highway. The tornado blew two cars from the highway, and debris from the house knocked out the windows and headlights of one of the cars. After the tornado crossed Highway 84, it damaged a carport on a house and peeled back the shingles on the roof of the house. It blew down several more trees and then lifted. Simpson County Pinola to 3 SW Mendenhall 1028CST Tornado (F1) The tornado touched down in the city of Pinola, damaging three houses and the roof of a store. The winds downed several trees. As it moved northeast through a wooded area, it downed numerous trees. Five miles southwest of Mendenhall, the roofs of five houses were damaged and numerous trees snapped in two. One elderly woman was injured in one of the houses. It also blew the roofs off two chicken houses. The tornado moved back into a wooded area and knocked down or snapped off numerous trees before lifting, 3-miles southwest of Mendenhall. Jackson County 22 1030CST 0 3 Gautier Thunderstorm Winds Several power lines were blown down in Gautier. Simpson County Mendenhall 22 1045CST Thunderstorm Winds Numerous trees were blown down in and around the city. Neshoba County 2 N Philadelphia 22 1132CST 0 0 4 0 . Thunderstorm Winds A roof was blown from a house, a tractor shed was blown down, and numerous trees were downed by high thunderstorm winds. Lauderdale County 22 1350CST 5 4 NW Lauderdale 0 Thunderstorm Winds Meridian Naval Air Station (NMM) reported the wall of a building had been blown down, and other damage (due to wind) had occurred across the base. Lowndes County Columbus Flooding Five hundred homes and 100 businesses were flooded when the Luzapallila Creek overflowed

moderately damaged.

its banks. Forty-four roads were flooded in and around the Columbus area, with three bridges

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME WIDTH OF Path LENGTH OF PATH LOCAL CHARACTER OF STORM PLACE **STANDARD** (MILES) (YARDS)

MISSISSIPPI Cont'd

Clay County 5 0 Flooding Widespread flooding was reported along Tibbee Creek, to the east of West Point along Highway 50, and in the town of Tibbee. Twenty homes were damaged east of West Point. Lee County 30 1330CST 0 0 3 0 Thunderstorm Winds Tupelo

A large sign was blown down across Main Street in Tupelo.

Chickasaw County 30 1400CST 0 4 0 Thunderstorm Winds Okolona

Numerous large trees were blown down. The roof of a truck repair shop was torn off and

thrown into a mobile home, causing damage.

0 30 1430CST 3 Thunderstorm Winds Clay County

Several trees and power poles were downed by straight-line winds across northwestern Clay County.

MISSOURI

MOZ007-011-012-017-

1600CST-018

2300CST ? Winter Storm

Rain changed to freezing drizzle and freezing rain on December 21st, and but me mixed with sleet and snow. Periods of sleet and snow, heavy at times, fell on December 22nd and 23rd. The total amount of ice and snow ranged from 4 to 8 inches across the area. A couple of layers of glaze were mixed in with the sleet and snow. Dozens of persons were treated at emergency rooms across the area.

MOZ012-017-018

0500CST-27 2200CST Winter Storm Heavy Snow

A band of heavy snow fell across the lead belt area, and was briefly mixed with sleet. Amounts of 6 to 10 inches were common in zone 18. Smaller amounts, generally 3 to 5 inches, fell in zones 12 and 17, including the St. Louis area.

MOZ010-011-014

1800CST ? ? Winter Storm Sleet

Very sharply falling temperatures changed rain into freezing rain and then sleet (ice pellets) across much of central and east-central Missouri. As much as 2 inches of sleet fell just south and east of Columbia on the evening of December 29th. Amounts of 1 inch were common over the area, with some freezing rain and snow, on the evening of the 29th and again on the 30th.

MONTANA

MTZ003 0100MST-

1000MST High Winds (G52)

Strong winds caused extensive blowing snow closing roads, schools, and businesses in the Browning area.

				T	NO	05	COTIN	MATER	DECEMBER 1990
		TIME			PER	SONS	ESTIN	AGE	
PLACE	DATE	D LOCAL STANDARD	LENGTH WIDTH PATH (MILES) (YARDS)	K-1-IIID	CHORCLE	4-8am 5020 a	റയാഗ	CHARACTER OF STORM	
MONTANA Co	ont'd								
MTZ007	03 04	0523MST- 1400MST	-		0	0	0	0	High Winds (G68)
MTZ003	04				0	0	2	0	High Winds (G61)
	An	outbuilding	near Vali	er was blo	wn o	ver.			
MTZ007	07 08	1700MST- 1050MST	-		0	0	0	0	High Winds (G52)
MTZ007	17	1530MST 1900MST	-		0	0	0	0	High Winds (G53)
MTZ001	18	0400MST	_		U	U	U	U	Ingli Willias (O33)
W112001	10	1400MST			0	0	5	0	Blizzard, Heavy Snow
	and chil	avy snow felloss of pow loss of pow l temperatu untain.	ll just ahea ver. North res to -40°	nd of, and yneastern wi c. Eight i	with, inds to nches	the A o 45 i of sr	rctic fi nph hi now fel	ront what the notal lates Ka	nich caused road and school closures orthern Flathead Valley giving wind alispell with 18 to 36 inches on Big
MTZ004	18	0600MST- 1500MST	-		0	0	3	0	Heavy Snow
	Eig	ht inches of	snow fell	at Helena					
MTZ008	18	0800MST 1500MST	-		0	0	0	0	Blizzard, Heavy Snow
	Five	e inches of	snow fell a	t Glasgow	and s	trong	winds	from t	he north caused blizzard conditions.
MTZ005	18	1230MST			0	0	0	0	Blizzard
	Judi	ith Gap rep	orted 73 n	nph winds	in ze	ro-vis	ibility.	•	
MTZ007	23 24	1500MST- 1000MST	-		0	0	0	0	High Winds (G57)
MTZ001	26 27	1700MST- 1100MST	-		0	0	4	0	Heavy Snow
	Elev	ven inches o	of snow fe	ll at the K	alispe	ell Ai	rport.		
MTZ001	27 28	1500MST- 1700MST	-		0	0	5	0	Blizzard
	Val offi	ong winds to ley. Drifts ces. Many inches.	o near 50 to 10 feet people we	mph cause clogged ro re strande	d bli: adwa d. Ti	zzard ys, cu ne sno	conditation point the condition of the c	ions ac ower a th at th	ross much of the northern Flathead and closing schools and Government the Glacier International Airport was
MTZ007	29 31	2200MST- 1200MST	-		0	0	0	0	High Winds (G66)
MTZ003	30 30	0700MST- 1000MST	•		0	0	0	0	High Winds (G50)
MTZ001	31	0500MST- 1700MST	•		0	0	3	0	Heavy Snow

Nine inches of snow fell at the Glacier International Airport. The resulting snow depth was a record-setting 34 inches.

90

		TIME			NO. PER	OF SONS	EST I	MATED AGE		DECEMBER 199
PLACE	DA	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-1-4WO		0.000mm0->-	COCOCIO	CHARACTER OF STORM	

NEBRASKA

?	?	?	Heavy Snow
		?	? ?

Six to 8 inches of snow fell from central to northeast and east-central Nebraska.

NEVADA

NVZ001-007 Northern and 1500PST-Central Nevada Truckee-Tahoe Area 20 0300PST Heavy Snow

Central Sierras East Slope A winter storm system dropped between 6 and 12 inches of snow over much of northern and

central Nevada, and the Sierras. Some high elevations reported over 2 feet of snow. NVZ001 Truckee-Tahoe Area 19

0000PST-0400PST 0 High Wind

Approximately 100 people were stranded on a tour boat on Lake Tahoe for about 4 hours, due to winds over 40 mph and very rough water.

Blizzard

NVZ002 Central Sierra 19 1030PST-East Slope 20 0300PST 0

Winds gusting to over 60 mph produced near-zero visibilities in blowing and drifting snow.

Mono County, CA 19 1615PST High Wind

Winds of 80 mph were reported in Mammoth Lakes, CA. A roof was blown from a house.

Clark County, NV 19 1638PST **High Wind**

Strong winds of over 60 mph, produced by an approaching winter storm system, blew the roof off a house in Henderson, Nevada.

NVZ001-009

All of Nevada Truckee-Tahoe Area Central Sierra, 1500PST-1500PST **2**Å ? ? 1 0 **Extreme Cold**

Some of the coldest temperatures experienced this century plagued all of Nevada during this period. Record low temperatures were set in most areas. Winnemucca set an all-time record-low temperature of -37°, while Ely set a new record low for December of -29°.

Most property damage from the extreme cold was light, and limited to broken water pipes; however, a performing arts center in Reno suffered over \$100,000 in water damage. Ranchers reported some loss of livestock. Most landscaping and nursery stock was damaged in the Las Vegas area. In Winnemucca, one death was attributed to the cold.

NEW HAMPSHIRE

NHZ006-007 Southeast

East Slope

03 04	Evening- Evening	0	0	?	0	Coastal Surge
03 04	Evening- Evening	0	0	?	0	High Winds

PLACE

TIME
D LOCAL
STANDARD
PATH
(MILES)

PLACE

D LOCAL
STANDARD
PATH
(MILES)

D LOCAL
STANDARD
PATH
STORM

D STORM

D CHARACTER
STORM

D STORM

D STORM

NEW HAMPSHIRE Cont'd

NH001-002-003-004 Central and 03 Evening-Northern 04 Evening 0 0 ? 0 Heavy Snow

Minor coastal flooding occurred along the 18 miles of coast, while inland 6 to 9 inches of snow fell. Damage was minimal with only minor beach damage. In Hampton, part of the southern end of a recently built seawall was damaged. Island Path was completely under water and the Hampton Beach Precinct Police Station parking lot was under 2 feet of water. Minor street flooding occurred in Portsmouth and wind gusts to 60 mph were reported. The wind caused some minor power outages while inland, the snow caused a few power outages as well as some school closures.

NHZ001-002-003 004 Coastal and Northern 15 Midday-16 Night 0 0 ? 0 Heavy Snow

Heavy snow fell over the area as a low pressure system developed along the coast of the U.S. to Connecticut near Bridgeport early on the 15th. This low underwent rapid intensification as it crossed the Gulf of Maine on the 15th. A low aloft followed this surface pattern and produced another batch of snow on the 16th. Snowfall totals ranged from 6 inches over the interior to 18 inches in some of the mountain locations. There were numerous automobile accidents, with some fatalities, during this snow event.

NHZ001-002-003-004-005-006-007 Statewide 21 Morning-Evening 0 0 ? 0 Freezing Rain

A large ocean high-pressure system over the western Atlantic circulated moisture over the state. As this high moved east on the 21st, a coastal frontal pattern moved from the southeastern United States to northern Maine. Freezing rain over all New Hampshire resulted in numerous automobile accidents as well as widespread power outages.

NEW JERSEY, Northern

Bergen County

04 0520EST-0800EST

0 0 ? 0 Flood

An intense storm centered over Ontario dumped between 1.50 to nearly 3 inches of rain across the area. The small streams in Bergen County were unable to handle this rain and the associated runoff, resulting in considerable flooding, especially along the Ho-Ho-Kus Brook.

NJZ007-015 Metropolitan and Coastal New Jersey 04 Morning 0 0 ? 0 Coastal Flood

The combination of high winds and a rather rare alignment of the earth, moon, and sun generated abnormally high tides, which in turn caused flooding along coastal sections. With the exception of just a few locations, the flooding was mostly minor.

NJZ001-005-007-015 28 0400EST-Northern New 1000EST Jersey

0 0 0 0 Heavy Snow

A secondary low-pressure center that formed along the mid-Atlantic Coast overnight, moved northeastward over the ocean during the early morning hours. Brisk northeasterly winds held temperatures down and ushered considerable moisture into the region. Snowfall amounts ranged for the most part between 6 to 8 inches, with Bridgewater and Harrison leading the area with 9 inches. The snow tapered off by midmorning as the low tracked east of Cape Cod.

DECEMBER 1990

		TIME			NO. PER	OF SONS	EST!	ATED GE	
PLACE	DA	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-L-L-L	OTTO CE ET	4- 22011 2020	WOODO	CHARACTER OF STORM

NEW JERSEY, Southern

NJZ002-004-006 All Southern New Jersey except Coastal Section

27 2400EST-28 0600EST

0 0 2 0 Heavy Snow

Snow began falling over the southwestern portion of southern New Jersey by 1600 EST, and spread over the remainder of southern New Jersey by 1900 EST. Accumulations had reached 4 inches by midnight over coastal Delaware Bay. The precipitation changed to sleet or freezing rain by 0100 EST, in that area, and then changed to all rain. This change spread north and west over all of southern New Jersey by 0600 EST. The total accumulation before the changeover was: 6 to 7 inches in the metropolitan Delaware Valley Zone, 2 to 6 inches in the southern interior and coastal Delaware Bay Zones, and 1 to 2 inches in the southern Coastal Zone.

NEW MEXICO

NMZ002-012 Colfax, Taos, Sandoval, Rio Arriba, Santa Fe Counties

13 2200MST-14 0500MST

0 0 0 0 Heavy Snow

An upper-level trough moved quickly through Utah and Colorado and combined with a cold air intrusion in northeastern New Mexico, causing snows mainly in the north-central mountains. Snow totals in inches included:

Taos Ski Area	14	Eagle Nest	7
Red River Ski Area	10	Wolf Canyon	7
Angel Fire Red River	10	Enchanted Forest	7
Red River	8	Ski Apache	4
Santa Fe Ski Area	8	Raton a	1-2
Chama	7	Star Lake	1
		Las Vegas	1

NMZ001-002-006-012 Colfax, Rio Arriba, Taos, Los Alamos, Santa Fe, San Juan, 1 McKinley, 1 Bernalillo, Catron, Lincoln Counties

15 2200MST-17 0500MST

0 0 0 Heavy Snow

An upper-level, low-pressure system deepened into southern Arizona and southern California, sending upper-level disturbances northeast into New Mexico, before moving across the state itself. These systems combined with low-level cold air already in place, and a tropical air mass which moved northeast into the state. Snow totals in inches included:

Red River	20	Sandia Peak	7
Chama	18	Star Lake	6
Taos Ski Area	17	Sippapu Ski Area	6
Angel Fire	16	Los Alamos	6
Dulce	12	Quemado Lake	4
Ski Apache	8	Farmington	3
Santa Fe Ski	8	Espanola	2
Enchanted Forest	8	Las Vegas	1
Gallup	7	Clayton	1
Wolf Canyon	7		

NMZ001-002-003-004-005-006-007-008-009-010-012 Colfax, Taos, Los Alamos, San Miguel, Rio Arriba, Santa Fe, Torrance, Valencia, Bernalillo,

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME LENGTH OF PATH WIDTH PATH LOCAL CHARACTER OF STORM STANDARD **PLACE** (MILES) (YARDS) **NEW MEXICO Cont'd**

Lincoln, O	ttero,	
Grant, Cat McKinley,	ron,	
McKinley, Counties	San.	Juar
COMITICS		

0800MST- 1800MST	0	0	0	0	Heavy Sno
					-

This snowstorm was caused, in part, by the massive intrusion of Arctic air which pushed south through Canada into the western United States. This Arctic air combined with a deep upper-level low-pressure system over the western states, and produced significant snow over most of the state except for the lower elevations of the south. Snow totals in inches included:

Sandia Ski Area Eagle Nest Cedar Crest Chama	48 34 29 24	Glenwood Santa Fe Turquose Quemado Lake	8887
Angel Fire	$\frac{27}{22}$	Los Alamos	ή
DIAZUS	21	Las Vegas Cliff	6
Edgewood Taos	15-19	Cliff	6
Taos	18	Farmington Gila Hot Springs Silver City Red Rock	5
Golden	17	Gila Hot Springs	5
Star Lake	14	Silver City	5
Meadow Lake	14	Red Rock	5
Albuquerque	4-14	Cloudcroft	4
Gallup	13	Clayton Tucumcari	3
Estancia	10	Tućumcari	3
Pietown	9	Espanola	3
Buckhorn	9	Espanola Roswell	1
Ruidoso	9		

NMZ002-004-012 Taos County Santa Fe County

	1400MST-					
27	0400MST	0	0	0	0	Heavy Snow

An upper-level, low-pressure system moved southeast, from off the northern California coast into southern California, then east into central Arizona, and northeast across northern New Mexico. This system produced snow only in the mountainous areas. Snow totals in inches included:

Taos Ski Basin	15	Apache Ski Basin	2
Angel Fire	8	Cloudcroft	2
Red River	7	Corona	2
Santa Fe Ski Basin	6	Quemado Lake	1
Chama	3	Los Alamos	1
Gallun	3		

Torrance County Clines Corners

28 0200MST-1700MST

1 1 0 0 **Heavy Snow**

McKinley County

A quick-moving, upper-level trough passed east across Colorado and northern New Mexico, producing spotty snow reports of 4 inches at Gallup, 2 inches in Santa Fe, and 1 to 2 inches in Albuquerque, and 1 inch in Farmington. A 66-year-old female passenger in an automobile died when her husband, the driver, lost control on an icy road east of Cline Corners, and struck a tractor-semitrailer parked legally along the road. (F66V)

NMZ002-004-006 Colfax County Rio Arriba County

29 30 1400MST-0500MST 0 **Heavy Snow**

An upper-level trough moved across Colorado, brushed the northern part of New Mexico, and combined with a cold-air intrusion into the north-central and northeastern parts of the state. Snow totals in inches included:

DECEMBER 1990

1		TIME			PER	SONS	DAM	AGE	
PLACE	P B E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-CIED	I NO DE LE	4-120m 40020 v	COCODA	CHARACTER OF STORM

NEW MEXICO Cont'd

Red River	7	Star Lake	2
Eagle Nest	4	Raton	2
Chama	2-6	Taos	1
Gallup	3	Clayton	1

NEW YORK, Central

Area Wide

0900EST-0100EST Winter Storm

The first winter storm of the season to hit upstate New York, dumped in excess of 6 inches in the Adirondacks. Many vehicle accidents were reported, including several which involved school buses. Snow also fell in the lower Hudson and Susquehanna River Valleys and Catskills, but only accumulated to about 4 inches, before changing over to freezing rain and then finally, all rain. (M63V, F62V, F33V, M27V)

Ulster County

1100EST-? 1500EST 5 0 Flood

Major flooding occurred along the Rondout Creek and Hudson River; at its peak, water was 6feet deep in the city of Kingston and the town of Esopus. Melted snow and rain amounted to 1.50 to 3.00 inches in the basin.

Oneida County Kirkland

1430EST-04 Flood 1900EST 0 O 0 6

Melting snow and more than 1 inch of rain resulted in flooding along the Oriskany Creek. Flooding was primarily confined to the town of Kirkland. Some minor flooding was also reported along State Route 5 where the Oriskany Creek passes under the road. Floodwaters affected more than 15 homes and seven businesses.

Area-Wide

04 PM-05 AM 7 High Wind

Strong gusty winds brought down power lines, tree limbs, and trees. In the central Adirondacks, high winds caused considerable damage. The Tupper Lake area was especially hard-hit with several homes destroyed, or badly damaged, by downed trees. Many residents were without power for 16 to 24 hours, before repairs could be completed.

Ulster County N. Dutchess County 10 10 1900EST 1910EST High Wind High Wind

> Gusty winds brought down power lines in Ulster and northern Dutchess counties. Central Hudson Gas and Electric reported over 400 customers without power during the event.

Area-Wide Area-Wide AM-PM PM Winter Storm

A mid-December storm delivered a mixed bag of precipitation to eastern New York. The storm started as snow and accumulated to about 4 inches over most of the area. By mid-afternoon, the snow changed to freezing rain and then finally ended as all rain, late in the day. Since this was an early-season storm, winter driving skills had not been sharpened. This resulted in hundreds of accidents. Two motor vehicle accidents, which resulted in three fatalities, were attributed solely to weather conditions. (F52V, M07V, M11 MonthsV)

DECEMBER 1990

	TIME		TIME NO OF ESTIMAT PERSONS DAMAGE			ATED AGE		DECEMBER		
PLACE	DA	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K L L E D	- A-JORMO		WTORU	CHARACTER STORM	

NEW YORK,	Central	Cont'c	l
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Area-Wide

22 PM

0 0 0 Record Heat

Unseasonably mild weather settled over eastern New York. In Albany, the temperature rose to 60°, setting an all-time date-record high. The previous record of 51° was set in 1967.

Warren County

Moreau 22 1848EST 0 4 4 0 Fog

Thick, dense fog created visibility conditions near zero; this was listed as the cause of a three-car accident.

Area-Wide 28 0300EST 1 ? 6 0 Winter Storm

Four to 7 inches of snow fell in portions of the lower Hudson Valley. Elsewhere snowfall totals amounted to 3 to 5 inches. As the storm wound down, temperatures rose into the 40s and 50s, creating considerable fog. (M36V)

NEW YORK, Coastal

Westchester County 04 0520EST-1500EST 0 0 ? 0 Flood

An intense storm centered over Ontario dumped between 1.50 to nearly 3 inches of rain across the area. Small streams, as well as the Saw Mill, Hutchinson, and Bronx Rivers, were unable to handle this rain and the associated runoff. Widespread flooding was reported, and the Saw Mill, Hutchinson, and Bronx River Parkways were closed due to the severe flooding.

NYZ015-016-017 Metropolitan New York and Coastal Areas of Long Island

04 Morning 0 0 ? 0 Coastal Flood

The combination of high winds and a rather rare alignment of the earth, moon, and sun generated abnormally-high tides, which in turn caused flooding along coastal sections. With the exception of just a few locations, the flooding was mostly minor.

NYZ014-015-016 Metropolitan New York, Western Suffolk, Rockland, and Westchester Counties

28 0400EST-1000EST 0 0 0 0 Heavy Snow

A secondary low-pressure center which formed along the mid-Atlantic Coast overnight moved northeastward over the ocean during the early-morning hours. Brisk northeasterly winds held temperatures down and ushered considerable moisture into the region. Snowfall amounts ranged for the most part between 6 to 8 inches. Warmer air over the Twin Forks region of eastern Suffolk County held amounts there to only 2 to 3 inches. The 7.20 inches in New York City broke the previous record for this day, that being 2.10 inches set in 1922.

NEW YORK, Western

New York

Deep low pressure over Missouri tracked northeast to the St. Lawrence Valley, and brought a mix of heavy snow and ice to the western half of New York.

Heavy, wet snow began falling around six in the morning. Between 4 and 7 inches fell over most areas. The snow continued until turning to freezing rain in the afternoon, depositing a layer of ice on most exposed surfaces.

DECEMBER 1990

		TIME			NO.	OF SONS	EST II	MATED AGE		DECE
PLACE	DA	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH PATH (YARDS)	K-1-m0	Omac C. Z. I		CACCAC	CHARACTER OF STORM	

NEW YORK, Western Cont'd

The heavy snow, falling tree limbs, and winds gusting to 45 mph caused numerous power failures. Tens of thousands of customers were left without electricity. Many schools and organizations canceled afternoon and evening events because of the weather.

Slippery roads and poor visibilities were blamed for many traffic accidents, including a ten-car pileup on an expressway in a Buffalo suburb.

NYZ001-022 Erie, Cattaraugus, and Chautauqua Counties NYZ002 Wayne County	04 05	2100EST 1200EST	0	0	4	0	Heavy Snow
NYZ004-005 Oswego, Jefferson, and Onondaga Counties	05	1500EST	0	0	4	0	Heavy Snow

A strong flow of cold air across the warm waters of Lakes Erie and Ontario produced lake-effect snow squalls. Between 6 and 10 inches of snow fell in localized areas to the lee of the lakes. Specific reports were as follows: Chautauqua County, Cassadaga 10 inches, Jamestown 6 to 8 inches, Sherman 10 inches, Cattaraugus County, Little Valley 9 inches, Hinsdale 8.5 inches, Wayne County, Sodus 6 to 10 inches, Oswego County, Oswego 4 to 6 inches, Jefferson County, Watertown 3 to 6 inches, Onondaga County, Syracuse 6 inches.

NYZ001 Erie County NYZ004	24	1730EST	0	0	3	0	Heavy Snow
Oswego County	24	2230EST	0	0	3	0	Heavy Snow

A brisk northwestern flow of Arctic air crossing the relatively warm waters of Lakes Erie and Ontario, produced lake-effect snow squalls and snowfall amounts between 6 and 10 inches. Reports included: Mexico, Oswego County, 9 to 10 inches; Elma, Erie County, 6 to 7 inches; and Marilla, Erie County, 8 to 9 inches.

NYZ001 Erie County NYZ021	29	2015EST	0	0	4	0	Flood
Orleans County NYZ022	30	0615EST	0	0	4	0	Flood
Cattaraugus County NYZ004	30	0930EST	0	0	4	0	Flood
Jefferson County	30	0930EST	0	0	4	0	Flood

A warm, moist southwestern flow ahead of a cold front brought heavy rains to the area. The unseasonably-warm temperatures caused snow cover, ranging from 2 to 6 inches, to melt. The heavy rains, up to 2.75 inches total, combined with snowmelt to produce drainage and road flooding. Numerous basements were flooded and roads closed. Area creeks and streams ran near bankfull through the first of January.

NORTH CAROLINA

Cherokee County							
Murphy	23	1420EST	0	0	0	0	Flash Flood

Minor flash flooding was reported on the Hiwassee River near Murphy, and on Brasstown Creek near U.S. Highway 64. During this period Murphy reported 4.50 inches of rain.

DECEMBER 1990

		TIME			NO OF ESTIMATED PERSONS DAMAGE			DECEMBER		
PLACE	D	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KILLED	- A DOMEO	4-200 may	COCOLO	CHARACTER OF STORM	

NORTH CAROLINA Cont'd

Swain County Bryson City

23 1630EST

0 0 Flash Flood 0

Flash flooding inundated the Deep Creek and Bear Hunter campgrounds, and destroyed an unoccupied mobile home near Land's Creek, west of Bryson City. Floodwaters also damaged the Bryson City Water Plant.

North Carolina Asheville Charlotte Greensboro Raleigh Cape Hatteras Wilmington

1990 Statewide

Record Warmth

The average yearly temperature for 1990 exceeded the all-time-average yearly temperature at each National Weather Service Office in North Carolina. Records went back to the early 1900s or the late 1800s.

NORTH DAKOTA

NDZALL

All of North Dakota 19-

5 0 Extreme Cold

Temperatures of -15 to -30°F combined with steady northern winds (15 to 30 mph) to cause chill factors of -50 to -80°F over North Dakota. In the town of Rolla (Rolette County), near the Canadian border, a wind chill factor of -87°F was calculated on the morning of the 21st.

Snow and blowing snow added to the hardship, especially in eastern North Dakota, where near-blizzard conditions occurred at times. The slick roads and snowdrifts led to many traffic accidents.

Many vehicles would not start in the extreme cold and some motorists were stranded for up to 9 hours. The cold also shattered car windows, froze pipes, damaged railroad tracks, and delayed air and rail travel.

NDZ013 Southeastern North Dakota

Night-Morning 29

2 0 0 0 Extreme Cold

Two brothers died of exposure near their farmhouse in rural Eckelson (Barnes County), 15 miles east of Jamestown. The temperature was -16°F with a wind chill factor of -46°F; visibility was reduced in blowing snow. Both men were dressed for winter. (M77O, M79O)

0

OHIO

Erie County Milan Marion County

Larue

1300EST-1700EST 1300EST-2400EST

4 Flood

0

Flood

Sandusky County Woodville

1300EST-05 0600EST

0 3 0 O Flood

3

DECEMBER 1990

		TIME			NO. PER	OF SONS	EST!!	MATED AGE	
PLACE	DAG-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-L-ED	CHINCLE		COCODA	CHARACTER OF STORM

OHIO Cont'd

Heavy rain over northern Ohio pushed some rivers into flood. The Huron River at Milan rose to 16.9 feet at 0400 EST on the 4th. This was 2.9-feet above flood stage. At Larue, the Scioto River rose to 11.2 feet at 1800 EST on the 4th. This was 0.2-feet above flood stage. The Portage River at Woodville crested at 9.2 feet at 2300 EST on the 4th. This was also 0.2-feet above flood stage. Minor damage occurred immediately along these rivers.

OHZ003
Northeastern
Lakechore

04 1300EST-05 0400EST

0 0 4 0 Lake Effect Snow

Heavy lake-effect snow developed off of Lake Erie, during the afternoon of the 4th into the morning of the 5th. The snow reached a depth of 6 inches in Ashtabula and Geuaga counties at 2300 EST. Final snow depths across extreme northeastern Ohio were between 4 to 8 inches.

Entire State

18 0000EST-19 1200EST

0 0 6 0 Urban and Stream Flooding

From 1 to 3 inches of rain fell across already-saturated soils causing many rivers, streams, and creeks to rise. Many rivers across mostly southern and eastern Ohio reached flood stage, but much of the damage was restricted to lowland farm areas near the rivers.

Adams County West Union

18 1000EST-19 0800EST

1830EST

0 0 4 0 Flood

0

Flood

The Ohio Brush Creek at West Union crested at 19 feet at 2130 EST on the 18th. This was 4-feet above flood stage.

Clermont County Milford

Warren County Kings Mills 18 1230EST-2100EST 0 0 3 0 Flood 18 1400EST-

The Little Miami River at Milford crested at 17.5 feet at 1600 EST on the 18th. This was just above the 17-foot flood stage. At Kings Mills, the Little Miami River crested at 17.2 feet at 1600 EST on the 18th. This was also just above the 17-foot flood stage.

3

Pike County Piketon

Pickaway County Circleville

Marion County Larue

Marion County Prospect

Pickaway County Circleville

18 28	1330EST- 0500EST	0	0	4	0	Flood
18 21	2100EST- 1200EST	0	0	4	0	Flood
22 24	0600EST- 1300EST	0	0	4	0	Flood
20 26	0400EST- 0700EST	0	0	4	0	Flood
23 26	0500EST- 0300EST	0	0	4	0	Flood

The Scioto River went into flood at Piketon and crested at 24.1 feet at 2400 EST on the 19th. This was well above the 16-foot flood stage. At Circleville, the river rose to 18.5 feet at 0330 EST on the 20th. This was 4.5-feet above flood stage. At Larue, the river crested at 11.8 feet at 1300 EST on the 22nd. This was nearly 1-foot above flood stage. At Prospect, the river rose to 11.5 feet at 1300 EST on the 24th. This was 1.5-feet above flood stage. At Circleville, the river crested at 16.7 feet at 1300 on the 24th. This was just above the 16-foot flood stage.

	T -	<u> </u>		1	NO	OF.	FSTIN	MATED		DECEMBER 1990
	P	LOCAL	LENGTH	нтдум	PER K	SON'S	ESTIMA BAMA		CUADACTED	
PLACE	Đ	STANDARD	PATH (MILES)	OF PATH (YARDS)	OH	- Demo		ONDOR	CHARACTER OF STORM	
OHIO Cont'd										
Hamilton County Miamitown	18 20	1600EST- 0600EST			0	0	4	0	Flood	
		Great Mia 19th. This						n and	crested at 18.5 fee	t at 0700 EST on
Hocking County Enterprise	18	1600EST-			•	•		•	T71 1	
Athens County Athens	20 20	0530EST 0300EST-			0	0	4	0	Flood	
	The	1230EST Hocking R	tiver at En	aterprise ro	0 se to	0 15.2	4 feet at	0 0730 I	Flood EST on the 19th.	This was 3.2-feet
	abo	ve flood sta ich was just	ige. At A	thens, the	Hock	cing R	liver ro	ose to	20.2 feet at 0700]	EST on the 20th,
Erie County Milan	19	0200EST- 0730EST			0	0	3	0	Flood	
Erie County Milan	22	0200EST- 1400EST			0	0	3	0	Flood	
Erie County Milan	23 24	0700EST- 0800EST			0	0	3	0	Flood	
	At		Huron Riv feet at 05 T on the	ver rose at 00 EST on 24th. Floo	ove the	flood 19th,	stage 15.3 fe	three t	imes during this f 3630 EST on the 2	lood episode. It 2nd, and at 16.6
Guernsey County Cambridge	19 22	0130EST- 1700EST			0	0	4	0	Flood	
	Wil	ls Creek at	Cambridg	e crested a	t 17.	1 feet	at 120	00 on t	he 20th. Flood sta	age is 14 feet.
Trumbull County Leavittsburg	19	1000EST- 2100EST			0	0	4	0	Flood	
	The abo	Mahoning ve 10-foot	River at I lood stage	evittsburg	rose	to 10).5 feet	t at 153	30 EST on the 19t	h which was just
Washington County Marietta	19 20	2330EST- 2400EST			0	0	0	4	Flood	
	The 1 fc	Ohio Rive	r at Marie e 35-foot	tta rose to flood stage	36.1	feet a	at 1000	EST ·	on the 20th. This	was a little over
0 1-3 0				· ·						

Sandusky County Woodville 22 1900EST-23 1300EST Flood Hancock County Findlay 23 1700EST-24 0230EST 0 0 4 0 Flood

DECEMBER 1990

		TIME			NO. PER	OF SONS	EST II	MATED AGE	
PLACE	D	LOCAL	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KILLED	T NOTE OF THE PERSON OF THE PE	4- 00 ma0300	CœOon	CHARACTER OF STORM

OHIO Cont'd

In northwestern Ohio, the Portage River at Woodville crested at 9.3 feet at 1000 EST on the 23rd, which was just above flood stage. The Blanchard River at Findlay crested at 10.2 feet at 2100 EST on the 23rd, which was also just above flood stage.

Guernsey and Noble Counties

1 S Pleasant City to Batesville A tornado touched down just south of Pleasant City damaging homes and a barn. It then traveled east through a forested area and fields, taking down trees and some power lines. The last point of damage was on Route 147, near Batesville, where two barns lost their roofs and homes received damage to siding. The tornado crossed into Noble County at 0419 EST.

OHZ002-003

Central Lakeshore 23 Northeast Lakeshore 24

23 1600EST-24 1400EST

0 0 4 0 Heavy Snow

Snow began falling over northeastern Ohio during the afternoon of the 23rd, with accumulations of 4 to 6 inches by 0700 EST on the 24th. Final snow depths reached 8 inches in Geauga County by the afternoon of the 24th.

OHZ005-009 Miami Valley Central, East Central, Southwest & South Central

27 1100EST-2400EST

0 0 5 0 Heavy Snow

Snow began falling over southwestern Ohio during the morning of the 27th, with accumulations reaching 4 inches by 1800 EST. Snow depths reached 4 inches from the Miami Valley through central and south-central Ohio by 2000 EST, and in east-central Ohio at 2200 EST. Total snow accumulations ranged from 4 to 6 inches over the southern half of Ohio; 8 inches fell in the Cincinnati area.

Entire State

29 0600EST-01 2100EST

0 0 7 0 Urban and Small Stream Flooding

A combination of a thick snowpack, rapidly-rising temperatures, and heavy rainfall caused widespread flooding across much of Ohio. Small streams, creeks, and rivers rose out of their banks flooding homes, businesses, and farmland. Some of the most affected areas were along the Ohio River and in northwestern Ohio. Hundreds of people were evacuated across the state and property damage estimates were nearly \$50 million.

Williams County Stryker

29 1700EST-06 0800EST) 0 5 0 Flood

Williams County Montpelier

29 2300EST-04 1100EST

0 0 5 0 Flood

The Tiffin River at Stryker rose to 17.4 feet at 1600 EST on the 31st. This was nearly 6.5-feet above flood stage. At Montpelier, the St. Joseph River crested at 17 feet at 2000 EST on the 31st. This was 5-feet above flood stage.

Erie County Milan

30 0200EST-31 2200EST

0 0 5 0 Flood

The Huron River at Milan crested at 20.7 feet at 2100 EST on the 31st. This was nearly 7-feet above flood stage.

	Ţ	TIME			NO.	OF SONS	EST IN	AATED		DECEMBER 1990
PLACE	D &	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K	Tay Use Line	0.9000mp->-	CROPA	CHARACTER OF STORM	
OHIO Cont'd										·
Hancock County Findlay Putnam County	30 01	0300EST- 1300EST			0	0	5	0	Flood	
Ottawa	30 02	1330EST- 1900EST			0	0	5	0	Flood	
	ES	oding occur T on the 31 O EST on t	st: this wa	is 4-feet al	ove i	lood	stage.	At Of	t, the river creste tawa, the river	d at 14 feet at 1300 rose to 18.5 feet at
Defiance County Defiance	30	0300EST-							:	
Henry County Napoleon	04 30	0900EST 0800EST-			0	0	5	0	Flood	
Wood County Grand Rapids	03 30	2300EST 0830EST-			0	0	5	0	Flood	
Lucas County Waterville	03 30	1000EST 0200EST-			0	0	5	0	Flood	
VV 3. -22 V 2.20	04	1400EST		led at all n	0 oints	0 along	4 the riv	0 	Flood	iver crested at 17.4
Country Country	feet rive floo was	t at 2300 ES er crested at od stage. A	ST on the 17.2 feet t Grand R ve flood s	31st. Thi at 1300 E apids, the stage. At	s was ST on river Wate	near Janu rose t rville	ly 7.5- lary 1, o 19 fo , the r	feet ab 1991. eet at 0 iver cr	ove flood stage. This was a little 700 EST on Januested at 14.4 fe	At Napoleon, the cover 5-feet above pary 1, 1991. This et at 0700 EST on
Cuyahoga County Independence	30 31	0400EST- 2200EST			0	0	5	0	Flood	
Summit County Old Portage	30 02	0500EST- 1300EST			0	0	4	0	Flood	
	nea	e Cuyahoga rly 6-feet at I on the 30	ove the 10	6-foot floo	d stag	e. A	t Old	Portage	t 1900 EST on t the river crested	he 30th. This was d at 10 feet at 2000
Lake County Willoughby	30	0500EST- 2200EST			0	0	4	0 .	Flood	• • • • • • • • • • • • • • • • • • •
		e Chagrin Ri od stage.	iver creste	d at 12.4 fe	et at	0730	EST o	n the 30	Oth. This was all	nost 3.5-feet above
Marion County Larue	30 01	0730EST- 1300EST			0	0	4	0	Flood	
Marion County Prospect	30 04	0730EST- 2000EST			0	0	4	0	Flood	
Pike County Piketon	30 08	1330EST- 1200EST			0	0	4	0	Flood	
Pickaway County Circleville	30 03	1900EST- 0730EST			0	0	4	0	Flood	

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME LENGTH OF PATH WIDTH OF PATH LOCAL CHARACTER PLACE **STANDARD** Ė STORM Ē (MILES) (YARDS)

OHIO Cont'd

The Scioto River went into flood at many locations. At Larue, the river crested at 13.2 feet at 2200 EST on the 30th. This was 2.2-feet above flood stage. At Prospect, the river rose to 14.1 feet at 1900 EST on January 1, 1991. This was 4.1-feet above flood stage. At Piketon, the river crested at 24.2 feet at 0300 EST on January 1, 1991. This was well above the 16-foot flood stage. At Circleville, the river crested at 21.2 feet at 0330 EST on January 1, 1991. This was well above the 14-foot flood stage.

Clermont County Milford

30 0800EST-31 0300EST

0 0 3 0 Flood

The Little River crested at 17.5 feet at 2400 EST on the 30th. This was 0.5-foot above flood stage.

Seneca County Tiffin

Fremont

0830EST-02 2300EST 0 0 0 Flood 1430EST-02 O 0 1900EST n 4 Flood 2300EST-01 1030EST 0 4 0 Flood

Wyandot County Upper Sandusky

Sandusky County

On the Sandusky River, flooding was widespread. At Tiffin, the river crested at 10.3 feet at 0700 EST on January 1, 1991. This was 2.3-feet above flood stage. At Fremont, the river rose to 12.8 feet at 1900 EST on the 31st. This was nearly 3-feet above flood stage. At Upper Sandusky, the river crested at 15.4 feet at 1900 EST on the 31st. This was near 2.5-feet above

flood stage.

Clarke County Springfield

1100EST-0230EST

0 0 4 0 Flood

The Mad River crested at 11.6 feet at 2200 EST on the 30th. This was just above the 11-foot flood stage.

Trumbull County Leavittsburg

1200EST-01 0230EST 0 0 Flood 1400EST-0 0 01 1600EST-O Flood 2230EST-0230EST 0 4 0 Flood

Trumbull County Warren

Mahoning County

Youngstown

At Leavittsburg, the Mahoning River rose to 15 feet at 1200 EST on the 31st. This was 5-feet above flood stage. At Warren the river crested at 13.7 feet at 1900 EST on the 31st. This was nearly 4-feet above flood stage. The river at Youngstown crested at 11.7 feet at 1900 EST on the 31st, which was near 2-feet above flood stage.

Licking County Newark

1900EST-2000EST

Flood

The Licking River rose to the 17-foot flood stage for a short time.

Hocking County Enterprise

2000ESTn 0 Flood 31 2330EST

The Hocking River at Enterprise rose to 14.3 feet at 1000 EST on the 31st, nearly 2.5-feet above flood stage.

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME WIDTH OF PATH LOCAL LENGTH CHARACTER PATH **STANDARD** PLACE OF Storm Ē (MILES) (YARDS)

OHIO Cont'd

Adams County West Union

2000EST-31

0 0700EST 0 Flood

Ohio Brush Creek crested at 19.1 feet at 0400 EST on the 31st. This was 4.1-feet above flood

Holmes County Killbuck

2200EST-

ŌĨ 0400EST Ω Flood O

Killbuck Creek crested at 16.5 feet at 0800 EST on the 31st. This was just above the 16-foot flood stage.

Sandusky County Woodville

2400EST-

1030EST

The Portage River at Woodville crested at 13.9 feet at 1300 EST on the 31st. This was nearly 5-feet above flood stage.

Flood

Flood

0

Morgan County McConnelsville

0400EST-31

2000EST 0 3 0 Flood

The Muskingum River at McConnelsville crested at 11.4 feet at 0700 EST on the 31st. This was just above the 11-foot flood stage.

Washington County Marietta

1300EST-

0 02 1930EST 0 4

The Ohio River at Marietta rose to 38.4 feet at 1900 EST on January 1, 1991. This was nearly 3.5-feet above flood stage.

Guernsey County Cambridge

1300EST-

2100EST 0 4 0 Flood O 02

Wills Creek at Cambridge crested at 15.1 feet at 0900 EST on January 1, 1991. This was 2.1feet above flood stage.

OKLAHOMA

OKZ004-005-006-007-008-009-010-011-012-013-014-015-016-017-019-020-021-022-023-024

All counties except Texas, Beaver,

Cimmaron,

0430CST

0300CST-0 0 6 6 Ice Storm

Pushmataha, Choctaw Freezing rain accompanied an Arctic surge across all of the state, except the extreme southeast and the panhandle. There were reports of thunder and lightning with the freezing rain at Holdenville, and a thunderstorm with sleet, freezing rain, and hail up to 0.50-inch in Pittsburg and McCurtain

County. There were numerous traffic accidents, especially in the Oklahoma City, Tulsa, and Bartlesville areas, as well as along the Turner Turnpike and along Interstate 35. A 46-year-old man was killed 2 miles north of Catoosa (OKZ012-) when he lost control of his car, and collided

DECEMBER 1990

		TIME			NO. PER:	OF SONS	EST II	ATED AGE	
PLACE	DAO-E	LOCAL Standard	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-L-L-W	OMMC/Z-	~- 	COCO	CHARACTER OF STORM

OKLAHOMA Cont'd

head-on with another vehicle. A man (unknown age) was killed after losing control of his pickup truck and crashed through a fence 5-miles east of Pryor (OKZ008-1). An 83-year-old man died after losing control of the car he was driving on an icy road in Bartlesville (OKZ007-1). A 35-year-old woman was killed in an automobile accident on an icy road 6.2 miles south of Sulphur (OKZ023-1). A 68-year-old man was killed after losing control of his travel-trailer on the ice, and crashed in Custer County. (OKZ014-1). A 25-year-old man was found dead from hypothermia 6-miles north of Sand Springs (OKZ007-1). He was walking when the Arctic-surge arrived and was wearing only a flannel shirt, blue jeans, and tennis shoes. There were six reported injuries from traffic accidents on icy roads. Ice, as thick as I inch, snapped power lines and tree limbs, and power failures were common. (M46V, MUNKV, M83V, F35V, M68V, M25O)

OKZ013-019-020-023-024-025-026 Cherokee, Adair, Sequoyah, Pittsburg, Haskell, Latimer, LeFlore, Murray, Carter, Love, Johnston, Bryan Atoka, Pushmataha, Choctaw, McCurtain Counties

0000CST-0700CST

0 Ice Storm

An accumulation of sleet and ice covered roadways and other exposed surfaces in portions of eastern, southern, and southeastern Oklahoma. Four people were injured in two traffic accidents on icy roads which occurred almost simultaneously, and almost adjacent, to each another on Interstate 35, 8-miles north of the Texas border at 0635 CST.

OKZ005-006-007-008-010-011-012-013-014-015-016-017-018-019-020-021-023 Grant, Garfield, Kay, Noble, Osage, Pawnee, Washingtion, Nowata, Craig, Ottawa, Delaware, Mayes,
Blaine, Kingfisher,
Logan, Payne, Lincoln,
Creek, Tulsa, Rogers,
Wagoner, Okmulgee,
Muskogee, Sequoyah,
Beckham, Washita,
Greer Kinswa Clevelan Greer, Kiowa, Cleveland, McClain, Pottawatomie, Seminole, Okfuskee, Pontotoc, Coal, Hughes, McIntosh, Pittsburg, Haskell, Latimer, Haskell, Lauma, LeFlore, Harmon, Jackson, Tillman, Comanche, Stephens, 29 0100CST

Cotton, Jefferson, Garvin, Murray,

0 0 Ice Storm

Carter, Love Counties

A strong Arctic front plowed across the state on the 29th and caused a 50° drop in temperatures in some places over the course of the day. At the National Weather Service Forecast Office in Norman, the temperature dropped from 57 to 27° between 0520 CST and 0550 CST. An accumulation of ice and sleet between 1 and 2 inches, blanketed the southwestern through northeastern parts of the state causing several hondred traffic accidents on icy streets. In Norman (OKZ016-), a 33-year-old man died from injuries he received when his car was hit headon by another, causing him to lose control on an icy road and veer into the oncoming lanes. A 50-year-old male driver skidded out of control on the ice, and into another car (OKZ015-).

DECEMBER 1990

		TIME			NO. PER	OF SONS	EST! DAM	MATED AGE		DECE
PLACE	DAG	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-LL	OMMCC.Z-	4-120mg0200	Cocopy	CHARACTER OF STORM	

OKLAHOMA Co	ont'd					
	the icy road, crossed the median an	d hit a	trācto	r-semi	trailer	, a 49-year-old man lost control on head-on. Another fatality occurred r-old male lost control of his vehicle traffic accidents caused by the icy
	Air travel was severely restricted, Rogers World Airport in Oklahoma storm. (M33V, M50V, F49V, M	and ab i City, 49V,]	out 2, when M52V	000 tr a majo , M23	avelers or airli V)	s were temporarily stranded at Will ne canceled all flights due to the ice
OREGON						
ORZ006 Northern Cascades	01- 02	0	?	0	0	High Wind
•	December started with a winter sto ranged from 28 inches at Timberlin south.	rm dui ne Loc	mping lge on	snow Mt. H	in the lood, t	northern Cascade Passes. Amounts to 14 inches at Santiam Pass farther
ORZ001	03 1600PST	0	0	4	0	High Wind
Union County La Grande	Wind gusting to 59 mph tore the roa car in the parking lot of the cowinds.	of fromplex.	m a L Fen	a Gran ces arc	de apa ound t	rtment building; the roof landed on own were blown over by the high
0RZ001, 011 Clatsop County Wallowa County	04 0100PST- 1000PST	0	0	4	0	High Wind
wanywa coansy	Building. A 26-foot frailer home displaced two trailer spaces. Winds feet of wheeled irrigating line was to see the control of	at Para s were flipped	adise (gustin I from	Cove R ig to 63 its fiel	Resort in the second of the second se	rtion of the Astoria Flight Service near Wheeler, was turned over and in northeastern Oregon. About 150 o the road. The Joseph Elementary ost Office in Joseph also sustained
All Zones	18- 19	0	0	0	0	Extreme Cold
	An Arctic-front pushed southward temperature records for the dates w Cascades including -35°F at Meach	ere rev	vritten	ı. Belo)w-zeř	snowfall down to sea level, and preadings were common east of the ria fell as low as 6°F.
ORZ001, 004 007	25	0	?	0	0	Ice Storm
	A rare white Christmas in northweethe day. The freezing precipitation Oregon as well.	stern (n exte	Oregoi nded i	n was ou	coated Colum	by freezing rain or drizzle most of bia River Gorge into north-central
ORZ008, 011 Deschutes and Union Counties	27	0	1	0	0	High Wind
Onion Counties	Another windy storm blew tall trees clearing downed trees when anoth measured up to 49 mph.	over i er tree	near Si e fell (un Riv	er. A n him.	volunteer fireman was injured while Gusting wind in La Grande was
ORZ011 East Union County	31	0	0	0	0	Blizzard

Fresh snowfall and strong wind created blizzard conditions. Route 237 was closed from Island City to Cove for a period of time.

DECEMBER 1990 ESTIMATED DAMAGE NO OF PERSONS TIME WIDTH OF PATH LENGTH OF PATH LOCAL CHARACTER OF STORM PLACE **STANDARD** E (YARDS) (MILES) PENNSYLVANIA, Eastern Lebanon County 04 1300EST 0 0 ? 0 **Flooding** Heavy rains of over 2 inches from Monday the 3rd into the 4th, resulted in flooding along the Swatara Creek. The creek reached a stage of 9.3 feet at Harpers Tavern with flood stage of 9.0 feet. The flooding occurred from 1300 to 1900 EST and caused the closing of a few roads. **PAZOOE** Eastern Pennsylvania 2300EST-0700EST (except extreme 28 2 Heavy Snow north and northeast) Snow began falling over the lower Susquehanna Zone around 1500 EST and spread north and east, over the remainder of eastern Pennsylvania by 1900 EST. Accumulations reached 4 inches by 2300 EST over the lower Susquehanna Zone, and by 0100 EST on the 28th, over the Southeastern Zone. Snow continued overnight was the final accumulations of 6 to 10 inches. Higher accumulations occurred over the south-central mountains. Accumulations were 3 to 5 inches from the Wilkes-Barre-Scranton area, north to the New York border, and also west across Bradford and northern Tioga counties. The snow had ended or tapered off to flurries by 0700 EST. **Lancaster County** 31 0130EST High Wind (G61) New Holland High wind gusts accompanying a cold front passage, flattened a 50- by 200-foot building at a fence manufacturing company; the wind also tore siding from 20 houses, moved heat pumps, broke windows, damaged garages, downed trees, removed doors at a lumber yard, and blew off skylights. The highest wind gusts were estimated at 70 mph and damage estimated at \$150,000. PENNSYLVANIA, Western 0 **PAZ015** 03 1105EST n O 0 **High Wind** Southwestern Trees and power lines were down in Indiana, Fayette, and Westmoreland counties from nonconvective high wind. **PAZ005** 0 0 03 1105EST High Wind Laurel Mountains Trees and power lines were down in Somerset County from non-convective high wind. **PAZ014** 03 2200EST 0 Heavy Snow North Central Mountains Six inches of snow accumulated at Kettle Creek State Park in Clinton County. PAZ002 05 0300EST Heavy Snow Northwestern Eight inches of snow fell in Summit Township in Erie County, and 6 to 7 inches at Corry, Edinboro, Albion, and Corry in Erie County. Washington County 14 SE Washington 18 1310EST Flood Ten Mile Creek was out of its banks and caused flooding of roadways near Marianna.

18 1310EST

flooding.

Greene County Waynesburg

The South Fork of Ten Mile Creek near Waynesburg flooded; Browns Run also reported

Flood

NECEMBER 1000

	ι				NO	05	ECTI	MATER		DECEMBER 1990
		TIME		İ	PER	SONS	EST IN	IGE I		
PLACE	Đ	LOCAL	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-1-mc	OMBOCIA		ഗ്രഹ്യ	CHARACTER OF Storm	
PENNSYLVANIA	A, \	Western C	ont'd							
Washington County 13 NW Washington	18	1340EST			0	0	0	0	Flood	
	Cro	oss Creek ne	ear Avella	was out of	banl	ks.				
Mercer County 5 SW Mercer	18	1345EST			0	0	0	0	Flood	
	Nes	shannock Ci	reek was o	ut of bank	s.					
Lawrence County 8 SE New Castle	18	1345EST			0	0	0	0	Flood	
	Slip was	opery Rock s flooded.	Creek in e	astern Law	rence	e Cou	nty wa	s out o	f banks; McConne	els Mill State Park
Greene County 12 SE Waynesburg	18	1717EST			0	0	0	0	Flood	
	Du Cre	nkard Creek ek also floo	t in southe oded.	astern Gre	ene (Count	y was	out of	banks with road f	looding. Browns
Fayette County 12 W Uniontown	18	1855EST			0	0	0	0	Flood	
	The	ere were flo	oded roads	s in Ronco	, nea	r Mas	ontow	n.		
Green County 12 E Waynesburg	18	1911EST			0	0	0	0	Flood	
	Stat	te Roads 20	03 and 30	09 were cl	osed,	and 1	Muddy	Creek	was over Route	2007.
Fayette County 3 S Uniontown	18	2010EST			0	0	0	0	Flood	
	Roa	ads between	Hopwood	and Fairc	hance	e were	e close	d.		
Washington County										
13 NW Washington 9 E Washington	18	2050EST			0	0	0	0	Flood	
	Cro Wa	oss Creek ne shington als	ar Avella : so flooded	and the sou	ıth br	anch	of Ten	Mile	Creek flooded; Pig	geon Creek east of
Westmoreland County 9 SW Greensburg	y 18	2230EST			0	0	?	0	Flood	
	Ac	ar was swe	pt downstr	eam during	g the	flood	ing in	Sewic	kley Township.	
Westmoreland County 16 S Greensburg	y 19	0050EST			0	0	0	0	Flood	
		obs Creek fl ement flood		ng 0.5 mile	of N	At. Pl	easant	Road	in Scottdale. Two	dozen homes had
Washington County 18 E Washington	19	0400EST			0	0	0	0	Flood	

Lock 4 at Charleroi on the Monongahela River was 11.5-feet above flood stage. The crest occurred at 1300 EST, 3-feet above flood stage.

DECEMBER 1990 NO. OF PERSONS ESTIMATED DAMAGE TIME WIDTH OF PATH LENGTH OF PATH LOCAL CHARACTER OF STORM **STANDARD PLACE** Ė (YARDS) (MILES)

PENNSYLVANIA, Western Cont'd Allegheny County 22 SE Pit 19 0700EST 0 0 0 Flood Lock 3 at Elizabeth on the Monongahela River was 0.3-feet above flood stage. It crested at 1.3feet above flood stage at 1300 EST. 23 0515EST Thunderstorm Wind **Beaver County** Fifty thousand homes were without power due to thunderstorm winds downing trees and power lines ahead of a fast-moving cold front. 0 0 Allegheny County 23 0515EST 0 Thunderstorm Wind 23 E Pit The roof was torn off a business in Plum, and thirty thousand homes were without power due to downed trees and power lines, as a cold front moved through the area. A Christmas tree at Point State Park was blown down. Armstrong County Kittanning 23 0530EST Thunderstorm Wind In Kittanning and Boggsville, trees and power lines were down, and nearly 5,000 homes were without power. Clarion County 19 SW Clarion 23 0540EST 0 Thunderstorm Wind A trailer was moved more than 5 feet from its foundation by wind. A tree fell into a house in East Brady. Allegheny County 23 SE Pit 23 0545EST 0 5 Thunderstorm Wind Roofs were blown off businesses in McKeesport and Versailles. Windows were blown out and a construction trailer was overturned. In north Versailles, a tree fell on two buses causing \$30,000 damage. A boat was crushed under three downed trees causing \$20,000 damage. Westmoreland County 8 W Greensburg 7 S Greensburg 23 0610EST 0 Thunderstorm Wind Power lines and trees were down in Irwin. In Greensburg a roof was blown off; a barn roof was also blown off in New Stanton. 23 0625EST 0 Thunderstorm Wind 15 E Greensburg Thunderstorm winds were responsible for felling a tree on a car in Ligonier. 9 E Greensburg 23 0642EST Thunderstorm Wind Construction trailers were blown around near Latrobe, and eight thousand homes were without power. 23 0650EST Thunderstorm Wind **Fayette County** O Sixteen-hundred homes were without power due to downed trees and power lines.

0

0

Heavy Snow

PAZ001

Lake Shore

24 1500EST

Seven inches of snow fell at Erie.

					· · · · · ·		,			DECEMBER 1	990
		TIME			PERS	OF SONS	ESTIN DAMA	ATED GE			
PLACE	DA	STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KI LIEO		←- ∞m0∞0	റയാഗ	CHARACTER OF STORM		
DENNICYT VANI	· A · T	Wastern C	lont'd							-	
PENNSYLVANI PAZ002	•	1500EST	ont a		0	0	0	0	Heavy Snow		
Northwest	Eig	ght inches of	f snow acc	umulated a	ıt Edi	nboro).		-		
PAZ013 Southern-Central	28	0210EST			0	0	0	0	Heavy Snow		
	Ter Jun	n to 12 inch liata and Mi	es of snow ifflin coun	/ fell in Fu ties.	lton a	nd H	unting	don co	unties. Seven to n	ine inches fel	l in
PAZ014 Northern-Central	28	0210EST			0	0	0	0	Heavy Snow		
Mountains	Sev	en to 8 incl	hes of sno	w accumul	ated in	n Cle	arfield	and C	Clinton counties.		
PAZ015 Southwest	28	0255EST			0	0	0	0	Heavy Snow		
	Six	to 7 inches	of snow	fell in the	southe	ern pa	art of t	he zon	e.		
PAZ005 Laurel Mountains		0455EST			0	0	0	0	Heavy Snow		
	Eig rep We	th to 13 incorred 13 incorred 13 incorred 13 incorred 14 incorred 15 incorred	ches of snaches. In County.	ow fell in the weste	the L ern pa	aurel art of	Moun f the z	tains. cone,	Central City, in S B inches fell at N	omerset Cour ew Florence,	ity, in
PAZ006	28	0915EST			0	0	0	0	Heavy Snow		
Southern-Central Mountains	Ele Cer	ven inches a	fell at Alto	oona with 1	13 inc	hes r	eportec	l in Be	edford County. Se-	ven inches fel	l in
Warren County 7 N Warren	30	0730EST			0	0	0	0	Flash Flood		
	Con	newango Cr od stage and	eek ran ou I did not g	it of its bar to below fl	nks ar ood s	nd car tage i	used fl until m	ooding idmor	g in Russell. It ros ning of January 1st	se 0.5-foot ab	ove
16 SW Warren	30	0800EST			0	0	0	0	Flash Flood		
	A r	road in Tidi	oute collpa	sed due to	flood	d run	off.				
8 W Warren	30	0800EST			0	0	0	0	Flash Flood		
	Bas	sements wer	e pumped	out in You	ıngsvi	ille at	fter the	flash	flooding.		
Crawford County Meadville	30	0800EST			0	0	0	0	Flash Flood		
7 S Meadville	Roa		ville were	under wate	er nea	r Cus	ssewag	o Cree	k; Route 19 south	of Meadville v	was
Erie County 14 SE Erie	20	OPOOLEGE			0	0	0	0	Flash Flood		
14 SE ENC		0800EST ute 8 in Wa	ttohura wa	s alosed di	_			U	riash rioou		
Erie County	KOI	uc o m wa	moung wa	o CIOSCU UI		110001	mg.				
14 SE Erie 27 SE Erie	30	0900EST			0	0	0	0	Flash Flood		
2. Va 2017	Flo Fre	oding occur nch Creek;	rred near Routes 6	Wattsburg and 426 in	at the	e con y wer	fluence e flood	e of the	ne western and eas	tern branches	of
Warren County 3 N Warren	30	0900EST			0	0	0	0	Flash Flood		

Minor street flooding occurred north of Warren, near Conewango Creek.

	Τ			T	Luo	OF.	FOTA	MATES.		DECEMBER 1990
		TIME			PER	SONS	ESTIM DAMA	IĞE		1
PLACE	DAO-E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	Comp.	OTTO CONTRACT CONTRAC	4-cam 00.00	COCOCO	CHARACTER OF STORM	
PENNSYLVANIA	L	Western C	ont'd	<u> </u>	<u> </u>	<u> </u>	<u> </u>			
Beaver County 8 N Beaver	·	0940EST			0	0	0	0	Flood	
		mall stream	flooded r	ear Route	18.					
Allegheny County 3 NW Pitt		0945EST			0	0	0	0	Flood	
12 NE Pitt	A n	nearby creek wnship, and	caused fl Rinnamor	ooding on 1 Run, a ti	Flau ributa	gherty ry of	Run Pine C	Road. Treek f	There was a mud looded.	slide in Crescent
Beaver County 6 SE Beaver	30	1015EST			0	0	0	0	Flood	
	Roa	ad and base	nent flood	ing occurr	ed in	Cent	er, Ho	pewell	, Economy, and Co	onway.
Armstrong County 15 S Kittanning	30	1015EST			0	0	0	0	Flood	
	Flo	oding occur	red near I	eechburg	and k	Ciskin	ninetas.			
Butler County	30	1015EST			0	0	0	0	Flood	
	Flo	oded roads	were repo	rted throug	ghout	Butle	r Cour	ıty.		
Mercer County 16 NW Mercer	30	1030EST			0	0	0	0	Flood	
	bets	le Shenango ween Metho ements were	dist Road	and Green	iville	ks in s -Sheal	several kley R	low-lyoad.	ying spots. The wo Downtown Greenv	orst flooding was ille flooded, and
Westmoreland County 21 NW Greensburg	y 30	1100EST			0	0	0	0	Flash Flood	
	Rou	oding occur ites 56 and 3 e washed or	356 in Alle	egheny Tov	ingto: wnshi	n area p. Ti	. Thei ributari	e was es of t	road flooding at th he Pucketa Creek f	e intersection of looded and roads
Butler County 13 SW Butler	30	1255EST			0	0	0	0	Flash Flood	
	The hole	breastwork is one acre	of Seven of water a	Fields Dar nd flows i	m in nto E	Cranb vans	erry T City; t	ownsh wo ho	ip was beginning t mes had to be evac	o wash away. It uated.
Lawrence County 11 SE New Castle 10 SW New Castle	30	1256EST			0	0	?	0	Flood	
20 2 2000 0200	floo Ellp	ding. An	nudslide o 351 was u	ccurred in	the	evenii	ng on	Route	rg Bridge, washed 488 near Perry T y, as water from Li	ownship outside
Armstrong County 11 SW Kittanning	30	1330EST			1	1	0	0	Flood	
	Т	o annogista i	vere out o	n Duffelo	C-001	* **	High !	T aval	Dridge in South Br	iffalo Township

Two canoeists were out on Buffalo Creek near High Level Bridge in South Buffalo Township. The canoe tipped over in the rain-swollen river; one man drowned and the other injured man suffered hypothermia after remaining in the water 11 hours. (M36O)

DECEMBER 1990 NO OF PERSONS ESTIMATED DAMAGE TIME LOCAL CHARACTER

PLACE	Ė	STANDARD	(MILES)	(YARDS)	O	OmbCc		90	STÓRM	
PENNSYLVAN	IA, V	Western C	Cont'd							
Crawford County 4 N Meadville	30	1340EST			0	0	0	0	Flood	
	The go	e French Cr below flood	reek was on I stage unt	ut of its bai til the early	nks a / moi	t Rout ning l	e 19 a nours (nd 6. of Jan u	French Creek, at Mulary 1st.	leadville, did no
Warren County 5 N Warren 24 NW Warren	30	1340EST			0	0	0	0	Flash Flood	
	Con the	newango Ci worst floo	reek contin ding since	ued out of 1947.	bank	s at R	ussell;	Broke	enstraw Creek in Co	olumbus reported
Venago County 5 NW Franklin 5 N Franklin	30	1340EST			0	0	0	0	Flash Flood	
	Fre its	ench Creek v banks, forc	was at its ling the clo	highest leve sing of ro	el in ads.	10 yea	ırs. Sı	ugar C	reek in Oakland To	wnship was over
Beaver County 7 NE Beaver 7 SE Beaver	30	1445EST			0	0	0	0	Flood	
1 S Beaver	Bru Sev	ısh Creek a vicklev Cre	nd Route : ek floode	588 floode d in Econo	d. T my	'he tov near S	vn of Shaffer	Vanpo Road	Creek rose 2-feet al rt also reported flo , with 500 people th water 4- to 6-fee	oded roads. Big were evacuated.
Mercer County 16 NW Mercer	30	1454EST			0	0	0	0	Flood	
	Ro	ads and sma	all streams	continued	to ru	ın higl	h; mai	nly in	northwestern Merc	er County.
Crawford County 18 E Meadville	30	1500EST			0	0	0	0	Flood	
		ompson Ru sed.	n Road wa	s under 6	nche	s of w	ater, a	nd My	stic Park and Doty	ville Roads were
Allegheny County 16 NE Pit	30	1530EST			0	0	0	0	Flood	
	Flo	oding occu	rred along	Pine Cree	k in 1	North	Hills	and Sh	aler.	
Allegheny County 17 NE Pit	30	1720EST			0	0	0	0	Flood	
	Ro	ute 8 at Saxo re flooded.	onburg Bo	ulevard was	s floo	ded.	Twelve	e famil	ies were evacuated	and 40 basements
Beaver County 12 NE Beaver	30	1720EST			0	0	3	0	Flood	
	To	nnoquenessi wnships, wa nage.	ing Creek iter was up	continued to the wine	to fl dow-l	ood ir level;	r Fran Frankl	klin T in Tov	ownship. In Mari vnship Beauty Shop	on and Franklin sustained \$4,000
Rutler County	30	1720EST			Λ	٥	Λ	Λ	Flood	

Numerous roads and streams continued to flood, especially in the southern part of the county.

DECEMBER 1990 ESTIMATED DAMAGE NO OF PERSONS TIME LENGTH OF PATH WIDTH OF PATH LOCAL CHARACTER PLACE STANDARD STORM Ė (MILES) (YARDS) PENNSYLVANIA, Western Cont'd Greene County
9 NE Waynesburg
8 W Waynesburg 0 0 0 30 1720EST 0 Flood Ten Mile Creek in the northern part of the county flooded. Roads were closed in Jollytown, Gilmore Township; between Rogersville and Rutan, and between Sycamore and Ninevah. Washington County 15 SE Washington 30 1720EST Flood Ten Mile Creek in the southwestern part of the county flooded. 30 1720EST n Flood Westmoreland County Flooding of streams, roads, and basements continued in the northwestern part of the county. Armstrong County 30 1730EST Flood 13 S Kittanning There was a mudslide in Leechburg, and Route 66 flooded Bethel Township. In Gilpin Township, a hydroelectric plant sustained considerable damage when a dam and embankment gave way. Allegheny County 15 E Pit 19 NE Pit 30 1950EST 0 0 0 0 Flood Evacuations continued in Hampton and Shaler Townships, with bridges closed in Etna, Shaler, and Hampton. The Allegheny River at Acmetonia was above flood stage. Westmoreland County 30 1950EST 0 10 W Greensburg 0 0 0 Flood North Huntingdon Township and Hartford Heights continued to report streams out of banks. Flooding also occurred. Armstrong County 5 SW Kittaning 6 E Kittanning 30 1950EST 0 ? 0 Flood 0 Road flooding occurred along Route 85. There was basement flooding in north Buffalo Township, Cowanshannock, and Margaret. In Dime, several homes and one business were 8 S Kittanning flooded. 30 1950EST **Jefferson County** Flood Minor road and basement flooding were reported. Washington County 4 SW Washington 30 1950EST Flood Flooding occurred along Ten Mile Creek near Route 18 in Lagonda. Clarion County 15 S Clarion 13 SW Clarion 30 2100EST Flood Roads in Lawsonham were flooded; Route 2009 at Cherry Run Road was closed. Beaver County 12 NE Beaver 30 2120EST Flood Flooding continued on Connoquenessing Creek in Franklin Township. Butler County 11 SW Butler 30 2120EST Flood

Flooding continued on Connoquenessing Creek in Butler County.

DECEMBER 1990 ESTIMATED DAMAGE NO OF PERSONS TIME LENGTH OF PATH WIDTH OF PATH LOCAL CHARACTER PLACE **STANDARD** STORM Ē (MILES) (YARDS) PENNSYLVANIA, Western Cont'd Mercer County 16 NW Mercer 30 2135EST 0 0 0 0 Flood Roads remained closed in northwestern Mercer County. North Summit Road in Greene Township flooded. Lawrence County 2 W New Castle 30 2200EST 0 Flood The Mahoning River was out of its banks in Union Township. **Allegheny County** 0 28 NE Pit 30 2200EST Flood A portion of Bull Creek Road near Tarentum washed away. Greene County 9 NW Waynesburg 30 2220EST 0 Flood Streams were over roads in Grayville and Ninevah. Routes 3008 and 18 were closed. **Crawford County** 18 E Meadville 30 2230EST 0 0 Flash Flood Meadville 8 SW Meadville Oil Creek was out of its banks north of Titusville, between Mystic Park and Hydetown. Roads were closed in Conneautville, Meadville, Union, and Greenwood Townships. Washington County 12 SE Washington 30 2335EST 0 0 0 Flood Ten Mile Creek was out of banks at Marianna. Allegheny County 2 NW Pit 31 0200EST 0 0 Flood

0

A mudslide occurred on Route 51 in Moon Township

Butler County 11 SW Butler

0455EST-31 1400EST

Flood

Flood

Evacuations continued along Connoquenessing Creek in Evans City.

Beaver County 12 NE Beaver 2 N Beaver

0455EST 2359EST 31

0 ?

Connequenessing Creek was still out of banks in northeastern Beaver County. The flooding lasted into January 1st. Also, Beaver River at Fallstonboro overflowed.

Between Beaver, Butler, and Allegheny counties, 288 homes sustained some damage from this flood. Thirteen homes had enough damage to be considered for Small Business Administration disaster loans.

Armstrong County 13 SW Kittanning

31 1000EST

0 0 0 Flood

Lock 5 at Freeport, on the Allegheny River, crested at 21.5 feet above flood stage. Flooding continued into the morning of January 1st.

DECEMBER 1990 NO. OF PERSONS ESTIMATED DAMAGE TIME LENGTH OF PATH WIDTH OF PATH LOCAL CHARACTER PLACE STANDARD STORM Ē (MILES) (YARDS) PENNSYLVANIA, Western Cont'd Allegheny County 13 E Pit 31 1000EST 0 0 Flood The Point at Pittsburgh was above flood stage. Washington County 17 E Washington 31 1100EST Flood Lock 4 at Charleroi was above flood stage on the Monongahela River. **Crawford County** 4 N Meadville 31 1200EST Flood French Creek at Meadville crested 1-foot above flood stage, and did not go below flood stage until early-morning of January 1st. **Fayette County** 16 NW Uniontown 31 1240EST 0 0 n Flood There was backwater flooding from the Monongahela River onto Downer Run Creek, and water on Route 201. Allegheny County 19 NE Pit 31 1300EST 0 0 Flood Lock 3 at Acmetonia crested 0.5-foot above flood stage on the Allegheny River. It remained above flood stage until early-morning of January 1st. Allegheny County 13 E Pít 31 1900EST Flood The Point at Pittsburgh crested at 2.2-feet above flood stage. This is the highest stage at the Point since Hurricane Agnes in 1972, when it reached 35.8 feet. Recession below flood stage occurred early on the morning of January 1st. Washington County 17 E Washington 31 1925EST Flood Lock 4 at Charleroi crested near 2.5-feet above flood stage on the Monongahela River. RHODE ISLAND RIZ002 04 0800EST-Coastal Flood 1100EST 3 0 Southern and southeastern gales combined with an unusually high astronomical tide to produce flooding of coastal roads and properties; however, no serious damage was reported. In Providence, the high tide was almost 4-feet above normal. The steel gates of the Fox Point Hurricane Barrier were lowered for the first time during storm conditions, since Hurricane Gloria in 1985. No serious flooding was reported. The peak wind gusts recorded at Providence and Block Island were between 40 and 45 mph from the south.

The first significant snowfall of the season brought from 6 to 8 inches to the northern portion of the state. The morning commute was slowed by many minor auto accidents. A total of 7 inches of snow fell in Providence.

0

Heavy Snow

RIZ001

28

0300EST-1000EST

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME LENGTH OF PATH WIDTH OF PATH LOCAL CHARACTER ROPS **STANDARD** PLACE OF STORM URLO (MILES) (YARDS) SOUTH CAROLINA **SCZ007** ? Northern Coast 03 0853EST 0 0 0 Coastal Flooding An alignment of the earth, sun, and moon, along with strong northeastern winds caused coastal flooding and beach erosion. SCZ001-002 0400EST-Mountains and **Foothills** 0300EST 3 0 Freezing Rain Sleet Light sleet and freezing rain fell mostly at higher elevations, but some ice accumulated on trees and objects above the ground as far south as Anderson, Fountain Inn, and Spartanburg. Some roads became slick, especially in the mountains. Little, or no damage was reported other than from traffic accidents. There were spotty, brief power outages, but no long-term disruptions. SOUTH DAKOTA Meade County 20 1400CST 0 3 0 Cold Sturgis A man was trying to thaw frozen pipes in his kitchen with a torch and started a fire. Pennington County New Underwood 23 0851CST 2 3 O **Blowing Snow** A couple was injured when a truck struck their car from behind. The cause of the accident was poor visibility due to blowing snow. Pennington County 23 0855CST Wicksville 0 Wind and **Blowing Snow** An accident involving two tractor-semitrailer trucks and a car occurred when one of the trucks (which was pulling a double-wide trailer) was blown over. The second truck stopped to avoid hitting the double-wide trailer; a car then smashed into the stopped truck to avoid the flippedover trailer. The driver of the car was injured. Shannon County 0800CST-Near Wounded 26 1800CST ? 0 Knee Cold

The Wounded Knee Memorial Ride was hampered by cold conditions. Several of the horseback riders suffered severe frostbite as temperatures dipped to -40°, and strong winds caused windchill values to dip to -80°. One rider broke a rib and another contracted pneumonia.

TENNESSEE

Bradley County 11 0830CST 12 51 0 Fog 5

An isolated area of extremely-dense fog formed along the Hiwassee River near Calhoun. Visibility along a 3-mile stretch of Interstate 75, which crosses the river, was quickly reduced to zero approximately 2 hours after sunrise. The blinding fog caused an 83-vehicle pileup near the Calhoun interchange. (M52V, F52V, F33V, F52V, F58V, M60V, M30V, M69V, F57V, M39V, M?V)

DECEMBER 1990

		TIME			NO.	OF SONS	EST II	MATED AGE	
PLACE	DA E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K T L L L L L L L L L L L L L L L L L L	OMBCCE	~	NOODO	CHARACTER OF Storm

TENNESSEE Cont'd

Coffee County

18 1030CST

0 2

0

Thunderstorm Winds

Thunderstorm winds ripped a 30-ton roof off a large business in Estill Springs, and tossed it onto five cars, injuring one man. Power and phone lines were downed and another man was injured when the tractor-semitrailer rig he was driving on Interstate 24 (about 7 miles south of Manchester) was blown over.

Warren County

18 1100CST

0 0

3

0

High Winds

Strong wind gusts damaged roofs and windows of a few buildings along the New Smithville Highway near McMinnville.

State

21-

Rain

The state experienced rain off and on, actually, from the 13th to the 21st. A series of storm systems moving slowly, from west to east, brought heavy rain to many locations in Tennessee from the 21st through the 23rd, causing widespread flash flooding and flooding. Following are listed known events.

Shelby County	21	1500CST-						
Sikilly County	21	2359CST		0	0	2	0	Flash Flood
Crockett County	21			•	•	_	•	1 11111 1 1000
		2359CST		0	0	2	0	Flash Flood
Fayette County	21	1500CST-		^	^	•	_	· 1711. 171
Tipton County	21	2359CST 1500CST-		0	0	2	0	Flash Flood
Tipion County	21	2359CST		0	0	2	0	Flash Flood
Haywood County	21	1500CST-		•	U	2	O.	
		2359CST		0	0	2	0	Flash Flood
Gibson County	21	1500CST-			_	_	_	
M F G .	~1	2359CST		1	0	5	0	Flash Flood
Madison County	21	1500CST- 2359CST		0	0	2	0	Flash Flood
Obion County	21	1500CST-		U	U	Z	U	riasa riood
Obion County	21	2359CST		0	0	5	0	Flood
Carroll County	21	1500CST	•	0	Ŏ	3	0	Flood
Weakley County	21	1600CST		2	0	5 5	0	Flood
Dyer County	21	1600CST			Ò	5	Ŏ	Flood
Lauderdale County	21	1600CST		0	Ŏ	Ş	Ŏ	Flood
Hardin County Wayne County	21 21	1700CST 1800CST		0	0	5 3	0	Flood Flood
wayne county	21	1000031		U	J	J	U	LIWAL

Heavy rain led to flash flooding and flooding, beginning on the 21st in western Tennessee. Flooded roads, as well as low areas, were numerous throughout the region; people were evacuated in several counties. Among the most affected counties were Obion, Dyer, Gibson, and Hardin. In Obion County, the North Fork of the Obion River went out of its banks and 108 people had to be evacuated; three people drowned in the floodwaters. In Weakley County, two people died Friday night near Gleason when about 2 feet of swift water pushed their car off a county road and into a drainage ditch where it was submerged. In Gibson County in the town of Trenton, a man drowned Saturday morning, the 22nd, when his truck was swept into a ditch and went under water. (M53V, F24V, M67V)

Coffee County	22	0100CST	0	0	5	0	Flood
Rutherford County	22	0100CST	0	0	2	0	Flood
Maury County	22	0100CST	0	0	3	0	Flood
Marshall County	22	0100CST	0	0	2	0	Flood
Rhea County	22	0930CST-					
•		2359CST	0	0	6	0	Flash Flood
Bledsoe County	22	1035CST-		_	_	_	
		2359CST	0	0	5	0	Flash Flood

										DECEMBER	1990
}		TIME	}		NO.	OF SONS	ESTIN DAMA	ATED			,,,,
PLACE	D A E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KILLED	ONIMACLE.		CACOTO	CHARACTER OF STORM		
TENNESSEE Co	nt'd									,	
Grundy County	22	1035CST- 2359CST	•		0	0	4	0	Flash Flood		
Sequatchie County	22	1035CST-	3		_		•	_			
Van Buren County	22	2359CST 1035CST-			0	0	3	0	Flash Flood		
Warren County	22	2359CST 1300CST			0	0	5 5	0	Flash Flood Flash Flood		
Marion County	22	1345CST-			U	U	,	U			
•	~~	2359CST		•	1	0	4	0	Flash Flood		•
Meigs County	22	1345CST- 2359CST	•		0	0	3	0	Flash Flood		
Hamilton County	22	1930CST-	•		_	- T	_				
Fentress County	22	2359CST 2100CST			0	0	3 5 5 5	0	Flash Flood Flood		
Overton County	22	2100CST			ŏ	ŏ	5	Ó	Flood		
Jackson County	22 22	2100CST			Ŏ	0	5	Ŏ	Flood		

As the heavy rain moved into middle and eastern Tennessee, flash flooding and flooding began in this area on the 22nd. Widespread flooding covered numerous roads, washed out bridges and roadways, flooded low areas, and drove numerous people from their homes. Numerous homes were damaged and destroyed. By far the worst flood damage occurred in Rhea County. About 0300 CST on the morning of the 23rd, Piney Creek, which forms from a spring on Grandview Mountain, rose over 20 feet, from almost 9 inches of rain during the day and night of the 22nd. The swollen creek raged through the Sand Town community west of Spring City. It destroyed over 50 businesses and several hundred homes. Three bridges were washed out, several mobile homes were twisted, and at least one house was moved off its foundation as some areas had more than 6 feet of water raging through them. Over 160 people were evacuated around Spring City as up to two-thirds of the town's homes were flooded. In Dayton, about 10 miles south of Spring City, Richland Creek, another seemingly docile stream, became a destructive torrent of water. It undermined railroad lines, washed away the gravel embankment, and left ties hanging from the rails in several places. The swirling water dug holes 8- to 10-feet deep into the gravel, exposing a 100-year-old railroad bed. Roaring Creek also flooded, damaging houses in Graysville. In all, over 400 homes were evacuated Saturday night and early Sunday. Total damage was estimated in Rhea County alone at over \$1 million.

Flood

One death was reported on the 22nd in Marion County, near Kimball. A woman drowned when she drove her car into a flooded secondary road and was swept away by the strong current. (F25V)

Franklin County	23	0030CST-		1	0	5	0	Flood
Roane County	23	0130CST- 1200CST		0	0	5	0	Flash Flood
Morgan County	23	0130CST-		U	U	,	v	Plash Plood
Morgan County		1200CST		0	0	5	0	Flash Flood
Cumberland County	23	0130CST-		_	_		_	
OI 7 O . A	-00	1200CST		0	0	5	0	Flash Flood
Claiborne County	23	0345CST- 1400CST	2	0	0	3	0 -	Flash Flood
Union County	23	0345CST-		U	v	,	U ·	TIASH THOOL
omon county		1400CST		0	0	3 5	0	Flash Flood
Anderson County	23	0400CST		0	0	5	Ō	Flood
Blount County	23	0445CST-			^		^	Fri 1 174 1
Vacy County	23	1730CST 0445CST-		0	0	4	0	Flash Flood
Knox County	23	1500CST		0	0	2	0	Flash Flood
Bedford County	23	0830CST-		•	•	~	•	1 11021 1 1000
•		2359CST		0	0	3	0	Flash Flood
Giles County	23	0905CST-		^	^	_	^	171 . 1. 171 1
Lincoln County	23	2359CST 0905CST-		0	0	2	0	Flash Flood
Lancon County	23	2359CST		0	0	5	0	Flash Flood
				-	_	_	•	

22 2100CST

White County

PLACE

TIME

LOCAL
STANDARD

PATH
(MILES)

PRESONS

PERSONS

CHARACTER
OF
STORM

STORM

TENNESSEE Cont'd

Sevier County

23 0935CST-1700CST

0 0 3 0 Flash Flood

More flooding began, as flooding continued in many areas of the state, while heavy rain continued moving eastward. More people had to leave their homes as floodwaters threatened. Roads were flooded, low-lying areas were filled with water, and streams throughout the area left their banks flooding homes and businesses in numerous communities. In Franklin County, near Estill Springs, a man drowned in raging floodwater. He had tried to drive his truck over a flooded bridge and the swift water carried the truck away. (M68V)

The state was devastated by these pre-Christmas floods. Over \$8 million damage was done, (early estimates), well over 500 people were evacuated from their homes, and five people were drowned in floodwaters. Nineteen counties were declared disaster areas.

TEXAS, Northern

•							
Shelby County 4 E Timpson	20	2220CST	0	0	?	?	Hail (1.50)
Rusk County 5 SE Concord	20	2220CST	0	0	?	?	Hail (1.00)
Panola County 3 NE Casthage 14 E Tatum	20 20	2240CST 2248CST	0 0 0	0 0 0	? 3 ?	??	Hail (1.00) Thunderstorm Wind Hail (1.50)
	Stro	ong winds blew down several	trees 14	mile	s east	of Tat	um.
Harrison County 1 SW Marshall Marshall Red River County 2 S Clarksville Marion County	20 20 20	2258CST 2306CST 2300CST	0	0 0	??	?	Hail (1.25) Hail (1.75) Hail (1.75)
Λ '411 1 °	20	222 <i>C</i> 20T	^	^	9	0	TT-:1 /1 AA\

Smithland 20 2325CST 0 0 ? ? Hail (1.00) **Smith County** ? Whitehouse 21 0840CST 0 0 Hail (1.00) Upshur County 21 0854CST 0 ? ? 0 Hail (0.75) 6 S Gilmer Harrison County ? ? 3 N Harleton 0900CST 0 0 Hail (1.75) Marion County 2 NW Jefferson ? 0 0 ? Thunderstorm Wind (G52) 21 0918CST Hail (1.00) Cass County 5 S Atlanta ? ? 0930CST 0 0 Hail (1.25) Panola County 1320CST Hail (1.75) Hail (1.75) Deadwood O 5 SE Deadwood Shelby County 3 N Shelbyville 1343CST 0 0 0 0 Hail (1.75) Thunderstorm Wind 1335CST Joaquin 0 O 1343CST 5 SE Deadwood Hail (1.75)

Strong winds blew down several trees at Joaquin.

TXZ022-023-027-028-032-033

028-032-033 21 1700CST-Northeastern Texas 23 0000CST

0 0 ? ? Winter Storm

DECEMBER 1990 NO. OF PERSONS ESTIMATED DAMAGE TIME WIDTH OF PATH LOCAL LENGTH CHARACTER PATH **STANDARD** PLACE SŤÖRM (MILES) (YARDS)

TEXAS, Northern Cont'd

A winter storm brushed much of northeastern Texas with a coating of freezing rain, sleet, and snow. Accumulations of ice amounted between 0.50 to 1 inch, over the counties located east of a line from Paris to Fairfield. Numerous automobile accidents resulted from the icy roads, with seven deaths and approximately 20 injuries blamed indirectly on the hazardous road conditions, or other storm parameters. Isolated power outages resulted when ice accumulated on some power lines in the area. Although precipitation ended around midnight of the 23rd, several roads remained slippery in spots throughout much of the day on the 23rd.

TXZ027-028-031-032 Northeastern Texas 0300CST-1200CST

0 0 0 0 -Freezing Rain

Freezing rain resulted in ice accumulations of approximately 1 inch or less, over that part of northeastern Texas east of a Greenville to Corsicana line. Several automobile accidents occurred due to the icy and treacherous road conditions, which indirectly resulted in at least one fatality and six injuries. Isolated power outages were reported when ice accumulated on several power lines in the area.

TEXAS, Southern

None reported.

TEXAS, Western

Lipscomb County Booker

02 1500CST 3

High Winds (G61) Gradient winds behind a fast-moving cold front gusted to 70 mph in Booker. The winds

damaged windows and small buildings in, and near Booker.

All of Western Texas

Afternoon-Afternoon

5 Extreme Cold

A powerful Arctic cold-front swept through western Texas from the afternoon of the 20th to the morning of the 21st. Temperatures dropped to below zero in the panhandle and into the single digits at most other locations. An elderly woman died of hypothermia in Childress on the morning of the 22nd.

There were numerous problems with burst water pipes due to the cold temperatures. Several reports of water damage to buildings in the panhandle were noted. In San Angelo, a radio tower was damaged when its insulated porcelain base froze and cracked.

Freezing drizzle accompanied the Arctic air. Scores of vehicle accidents were reported due to the icy conditions, with four fatalities and several injuries resulting from the incidents. Most of the traffic accidents occurred in the Permian Basin, Concho Valley, and Far West. (F800)

Most of Western Texas

Afternoon-Morning

Extreme Cold

A second Arctic blast moved through all but far-western Texas on the 27th. Temperatures dropped into the single digits and lower teens across most of the affected area. As with the earlier Arctic front, most of the reported damage was due to broken water pipes. Several minor traffic accidents occurred across the area, but no deaths or injuries were directly related to the cold.

		TIME			NO.	OF SONS	EST II	MATED AGE		DECEMBER 1990
PLACE	D	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	P C	OMMCL2-	4-campo.vv	COCOLIN	CHARACTER OF STORM	

UTAH

UTZ001 Southern Utah

Mountains

2200MST-1100MST

0 Heavy Snow

A moist southwestern flow brought heavy snow to portions of Utah's southern mountains. Amounts of 10 to 15 inches fell overnight.

UTZ001-002-003-

006-010 Western Utah Valleys and Northern Mountains

1600MST-1200MST 14

Ω 5 0 Heavy Snow

A fast-moving vigorous cold front deposited 4 to 10 inches of snow in the valleys and 12 to 23 inches in the mountains through the night and into the morning hours. Numerous minor traffic accidents occurred due to the snow.

UTZALL

1730MST-1200MST

45 6 Heavy Snow

A large, cold winter storm moved into Utah late in the afternoon on the 18th, and continued to affect the state into the day on the 20th. All of Utah received at least some snow. The St. George and Lake Powell areas that normally remain snow-free, each received about 0.50 inch of snow. In the other valleys, storm totals ranged from 5 to 18 inches and from 12 to 33 inches fell in the mountains. Snowy roads caused two tractor-semitrailers to collide with a bus, resulting in seven fatalities and 41 injuries. Three additional injuries occurred in other weatherrelated traffic pile-ups.

UTZ006-009 Southwestern Utah Valleys

0600MST-19 1000MST

0 2 0 High Winds

Strong winds preceded a cold front into Utah's southwestern valleys. Gusts to 66 mph occurred in Cedar City and 58 mph at St. George. This front was associated with the same storm mentioned above.

UTZ001-003 Northwestern Valleys

1900MST-1200MST

2 5 0 High Winds

The deep low-pressure area over southern Utah and an Arctic air mass over Wyoming, associated with this winter storm, produced strong eastern winds and bitterly-cold wind chills, at the mouths of east-west oriented canyons, from Utah County north to the Idaho border. Peak gusts of 59 mph were reported. Winds snapped power lines and drifting snow over roads caused several accidents.

UTZALL

0000MST-21 26

1200MST 1 5 7 6 Extreme Cold

The same winter storm also brought an Arctic air mass to Utah. Record cold temperatures were reported statewide during the six-day period with cold high, as well as low, records broken. One homeless man was found frozen to death, and injuries were caused by frostbite and vehicle accidents. Many buildings and homes were damaged by broken water pipes and fires; significant numbers of fruit trees were damaged or killed in the northwestern valleys.

UTZALL

1800MST-31 2400MST

5 O 6 Extreme Cold

A second surge of Arctic air put Utah back in the deep freeze for the last days of the year, breaking more records. Additional water and fire damage occurred to homes and businesses, but there were no additional injuries or deaths. Fruit trees also sustained some additional damage.

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME LOCAL LENGTH CHARACTER

PLACE	E	STANDARD	PATH (MILES)	PATH (YARDS)	E	DATE:	- حوس ا 10	Ops	OF STORM	
VERMONT										
Statewide	03 04	Afternoon Early AM	!-		0	5	5	0	Winter Storm	
	cha	najor winter nged to free o-car accider	ezing rain	by late M	onday	ever	ung.	The w	The storm started a rinter weather was roont.	s snow and then esponsible for a
Statewide	13	AM- Early PM			0	6	?	?	Freezing Rain	
		ezing rain a storm-relate			ed ha	zardou	us driv	ing co	onditions. Six perso	ons were injured
Statewide	15 16	Early PM- Early PM	-		0	8	5	0	Winter Storm	
	wea	snow storm ther conditi the state, the	ions were	responsible	tor s	evera	l accid	ents ar	inches. The State cound the state. In sectorm.	Police reported outhern portions
Statewide	18	0400EST- 1200EST			0	3	6	0	Freezing Rain	
	Tue	esday morni merous roac	ing. Free:	zing rain a	accum	ulateo	d to at	out 0	winter storm, were .25 inch in most pa noon, poor weather	rts of the state.
VIRGINIA										
Albemarle County City of Charlottesville	18	1200EST- 1700EST			0	0	4	0	High Winds	
	leav	ing some	3.400 hor	nes withou	ıt ele	ctricit	v in b	ooth A	using numerous pov Albermarle County Charlottesville Airpo	and the city of
City of Lynchburg	27 28	1800EST- 0300EST			0	0	4	0	Ice Storm	
	Fre tree	ezing rain for stores to fall, an	ollowing a d resulted	snowstorr in power	n coat	ted tre	e limb over 7	s and ,000 i	power lines, causing n the Lynchburg are	many lines and
VAZ005-011-012	27 28	1800EST- 1300EST			0	0	0	0	Heavy Snow	
	and Wir We	the north nchester 8 i ather 8 inch	ern and c nches, Fro es, Vienna	entral She ont Royal a 5 inches,	nande 9 inc Man	oah V hes, V assas	Valley. Woods 4 inche	Rep tock 7 es, Wa	inches on the northworesentative storm inches, Herndon 7 ashington National arkway in Page Council and the story of the st	totals included: inches, Mount Airport (DCA) 3

nt d: nt 3 along the Skyline Drive, and 7 inches in northwestern Rockingham County. Amounts were lower in southern Rockingham County, and in northern Virginia east of the mountains, due to freezing rain and sleet in the latter stages of the storm.

VAZ005-006-009-010-017-018 27 1800EST-28 0700EST 0 5 0 Ice Storm

DECEMBER 1990

		TIME			NO. PER	OF SONS	ESTII DAM	MATED AGE	
PLACE	Đ	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K T L MED	OTTO CLE	P-0200-1	CACOD-W	CHARACTER OF STORM

VIRGINIA Cont'd

Widespread power outages and tree damage were reported in Albermarle, Spotsylvania, Caroline, Louisa, Hanover, Amelia, Amherst, Goochland, King William, Henrico, Nelson, Powhatan, Culpeper, Fluvanna, and Rappahannock counties (as well as the city of Charlottesville), as a result of freezing rain which followed a light accumulation of snow in many areas. More than 25,000 customers were left without electricity as long as 24 hours.

WASHINGTON

Southern Coast 01 1000PST 0.2 10 0 0 4 0 Tornado (F0)

A tornado briefly touched down in South Bend Saturday morning. The tornado blew out some windows at one residence, destroyed a concrete wall at the local school, and tossed a Volkswagen 30 feet into the air.

WAZ002 Northwestern Interior

03 Evening 0 0 4 0 High Winds

Winds ahead of an approaching cold front gusted to 60 mph around Port Angeles and Ferndale. Several trees were uprooted causing an estimated 15,000 people to lose power in Port Angeles; one building was destroyed in Ferndale.

WAZ005 Southern Coast

04 Morning 0 0 2 0 High Winds

Winds, gusting between 50 to 60 mph, were reported all morning along the southern coast. Damage was minor with only a few trees blown down. Power was briefly out to an estimated 2,000 customers as a tree fell over a power line.

WAZ002-004-007-009 Northern Coast,

Northwestern Interior and Northern-Central 17 Evening 0 0 2 0 High Winds

The first blast of Arctic air moved into the northern sections of the state Monday evening. Wind gusts of 60 to 70 mph were reported along the northern coast at Neah Bay in Jefferson County, and on Camano Island. In eastern Washington, wind gusts of 60 and 78 mph were reported at Wanapum Dam and Priest Rapids, just before midnight. Only minor damage was reported in Jefferson County.

WAZ00W WAZ001-002 Western Washington 18

18 1200PST-2200PST 19 1600PST

2 ? 7 ? Snowstorm High Winds

A strong Arctic front moved through western Washington during the evening of the 18th and the early-morning hours of the 19th. North to northeasterly winds, gusting over 50 knots, began blowing in the Bellingham area just after midnight. The northern winds reached the northern portion of the Puget Sound area by early-afternoon. With the Arctic front still over southern British Columbia, a local phenomena known as the Puget Sound convergence zone, developed around noon over the northern Puget Sound area. Snow began falling in Kitsap and southern Snohomish County around noon, with the snow beginning in downtown Seattle around 1400 PST. The snow didn't begin over the southern part of the city until 1800 PST. Snow amounts were heaviest in the area where the convergence zone developed. This area, between the Olympic and Cascade Mountains, from downtown Seattle on the southern end, and Everett on the northern end, received between 6 and 14 inches of snow. Outside this band 1 to 4 inches of snow fell as the Arctic front moved through western Washington. Northern winds gusting over 50 knots, continued from Seattle northward until late Wednesday afternoon. Exposed areas along the Puget Sound were pounded by the strong winds and 4- to 8-foot waves. The most affected areas were

DECEMBER 1990

		TIME			NO. PER	OF SONS	EST IN	ATED GE	
PLACE	Đ	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KILLEO	CHING C.K.	4-cama0:0:0:0	COCO COCO	CHARACTER OF STORM

WASHINGTON Cont'd

Whatcom, Island, and Kitsap counties. At one point, three out of every five power customers in Whatcom and Kitsap counties were without power. In Kitsap County, the Seabeck Marina was heavily damaged by the north winds with 80 of the 88 boats damaged, in addition to \$500,000 damage to the dock. Numerous waterfront homes in Kitsap County, the San Juan Islands, and on Bainbridge Island were damaged when the waves crashed into the structures. In the southern part of the Seattle metropolitan area, a 1,400-foot section of Redondo Beach Drive fell into Puget Sound, as the waves eroded the beach front away. Two people died during the storm. A 90-year-old male was killed in a car accident north of Poulsbo, as the car in which he was a passenger spun out of control. Another man of unknown age died on Bainbridge Island when a tree fell on him. (M90V)

WAZ006-009-010 WAZ006 Eastern

18 2200PST-19 1000PST 0 0 4 ? Snowstorm 19 Early Morning 0 0 4 ? High Winds

The Arctic front which moved through the state on the 18th and 19th, went through eastern Washington on the evening of the 18th and the early-morning hours of the 19th. Snow amounts ranged from just a trace in the Spokane area to 8 inches in the outlying areas of Spokane. Six inches of snow fell at Walla Walla overnight. Strong northern winds were reported behind the front with gusts over 50 mph in the Davenport area.

WAZOOW WAZOOE

Statewide

19-22 0 0 5 ? Hard Freeze 19-25 0 0 5 ?

Cold Arctic air moved in over the state, behind the front which passed through the area on the 18th and 19th. Highs in the 20s and lows in the teens were common in western Washington, with the coldest night being the 21st, when many places south of Olympia dropped below zero. The cold temperatures combined with the northern winds, produced wind chills in the 0 to -30° F range. Temperatures in eastern Washington were even colder with highs only in the teens, and lows ranging from 0 to -20° F. On the 21st and 22nd, many highs were only in the single digits.

WAZ001-002-003 Western Washington

8 0400PST-9 0400PST 2 ? 7 ? High Winds Snowstorm

The second strong Arctic front in less than two weeks moved through Washington State Friday. Snowfall amounts in western Washington ranged from a trace in most locations, to 6 inches outside of Kent. The combination of high tides and strong northern winds behind the front, once again caused substantial damage along exposed waterfront areas. Eleven homes were damaged at Diamond Point by the winds and waves. A partial list of peak wind gusts on Friday includes: the Hood Canal Bridge, 78 mph; Bellingham, 63 mph; NAS Whidbey Island, 58 mph; and Alki Point in Seattle, 58 mph. Two people were killed during the storm. One, a 24-year-old male, died when a tree fell on his car near Anacortes. The other fatality was a 47-year-old female, who was also killed by a tree falling on her car. This occurred on Vashon Island. (M24V, F47V)

WAZ-ALL Statewide WAZ006 29- 1000PST 31 0 ? 5 ? Hard Freeze 30 1800PST 0 ? 5 ? Snowstorm

Cold Arctic air behind the front which went through on the 28th and 29th dropped overnight lows in the single digits and teens on the 29th and 30th in western Washington, and into the single digits to -20° on the 29th through the 31st, in eastern Washington. High temperatures in western Washington climbed above freezing for the most part on the 30th. Highs in eastern Washington ranged from -5° to $+10^{\circ}$ on the 29th and 30th with some areas climbing above freezing on the 31st. A weather system on the 30th brought snow to areas near the Idaho border. Around Spokane, 4 to 8 inches of snow fell with lighter amounts elsewhere.

DECEMBER 1990

		TIME			NO. PER	OF SONS	EST II	MATED AGE	
PLACE	DATE	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	P. C. TERO		4-59m00x0	UTOXC)	CHARACTER OF STORM

WEST VIRGINIA

Hancock, Brooke, Ohio, Harrison, Marion, Monongalia, Preston, Doddridge, Tyler, Wetzel, Ritchie, Wood, Wirt, Wayne, Cabell, Mason, Jackson Counties

18 0700EST-2300EST-

0 1 4 0 Small Stream Flooding

Minor stream overflow was widespread over northern and western counties. Two to 3 inches of rain fell in 48 hours over saturated ground; several county roads were blocked by high water. No structural damage was reported but some basements were flooded. Some residents were either isolated in their homes, or prevented from returning to their homes. The Tyler County Sheriff's Department reported a few vehicles received water damage, when drivers tried to cross flooded roads. Along Proctor Creek in Wetzel County, a woman was rescued by volunteer firemen around 2300 EST, when her minivan slid into the creek. She had swerved the vehicle to avoid a mudslide, and the van was swept about 250 feet downstream. She was slightly injured. In a separate incident, a Marion County couple was rescued by State Police and a passerby from a flooded vehicle along Route 250 near Fairmont.

Some of the streams affected include: Kings Creek near Weirton, Harmon and Cross Creeks in Brooke County, Wheeling Creek in Ohio County, Middle Island Creek in Doddridge, Tyler, and Pleasants counties, French Creek in Pleasants County, Left and Right Forks of Sandy Creek in Jackson County, South Fork of the Hughes River in Ritchie County, and Fishing Creek in Wetzel County, and Paw Paw Creek in Marion County. Urban flooding occurred in Salem of Harrison County.

WV001 002-003 Ohio River

19 2200EST-21 0800EST

1 0 ? 0 Minor River Flooding

The Ohio River exceeded flood stage at a few locations: Wellsburg crested at 36.5 feet (flood stage 32), Parkersburg reached 36.8 feet (flood stage 36), Point Pleasant had 40.7 feet (flood stage 40). Backwater from the Ohio River caused the Little Kanawha River to flood homes and a golf course clubhouse near Parkersburg. The last time Parkersburg exceeded flood stage was in late February 1979. A woman drowned in about 3 feet of water from the Little Kanawha River on Wirt County Route 35/2. She became entangled in barbed wire after exiting a flooded vehicle around 2200 EST on December 19th. (F31V)

Berkeley County 2.5 N Hedgeville

26 0200EST

6 0 ? 0 High Water

Six family members drowned when their car was swept off a low-water bridge and into Back Creek near Allensville. Police indicated the car may have slid onto the bridge, as a result of ice on the curve approach. Back Creek had been swollen by recent rains to about twice its normal flow, but was still within its banks. (M62V, F30V, M31V, M10V, M05V, M02V)

WV007-008-009-012 Mountainous Counties 27 1100EST-1900EST

0 0 ? 0 Winter Weather

One to 4 inches of mixed snow, sleet, and freezing rain occurred.

WV010-011 Potomac Highlands and Eastern Panhandle

27 1200EST-2300EST

0 0 ? 0 Heavy Snow

Eight to 13 inches of snow fell. Keyser reported 12 inches, Romney and Martinsburg had 10 inches, and Moorefield observed 8 inches.

Preston, Randolph, Upshur, Barbour, Harrison, Lewis, Marion, Monongalia,

DECEMBER 1990 ESTIMATED DAMAGE NO. OF PERSONS TIME LENGTH OF PATH WIDTH OF PATH LOCAL D ROPS CHARACTER **PLACE STANDARD** STORM (MILES) (YARDS)

WEST VIRGINIA Cont'd

Doddridge, Lincoln, Jackson, Putnam, Raleigh, Greenbrier, Cabell, Wayne, Brooke, Hancock, Marshall, Mason

Counties

30 1500EST-2330EST

? 0 Small Stream **Flooding**

Minor small stream flooding was again widespread when 1.50 to 2 inches of rain fell in 24 hours. County roads were blocked and basement flooding was common. A few buildings in Hamlin, Lincoln County, were evacuated as a precaution. No structural damage was reported throughout the flood event. A few of the streams affected include: Spring and Howard Creeks of Greenbrier County, Lost Creek in Harrison County, Buffalo Creek around Mannington in Marion County, and Big Wheeling and Fish Creeks in Marshall County.

As a result of this rain event, several points along the Ohio River crested above their flood stage on the first 2 days of 1991. (Refer to January, 1991 Storm Data)

WISCONSIN

WI004-005-006-007-008-009-010-011-012-013-014-015-016-017-018-019-020

Northeastern, Central and Southern Wisconsin

02 Late Evening-04 Early Evening

? 0 0 Blizzard

A major winter storm developed into blizzard conditions across the southern two-thirds of the state. A heavy snow swath of 14 to 18 inches fell from Cassville (Grant County) through Madison to Green Bay, with one report of 22 inches at Adams/Friendship in Adams County. Madison to Green Bay, with one report of 22 inches at Adams/Friendship in Adams County. A widespread area of around 1 foot fell from Lacrosse to Oconto (Oconto County), and from Beloit (Rock County) to Port Washington (Ozaukee County). Record snowfalls of 18 inches were recorded at Madison and 13 inches at Green Bay. Winds of 20 to 40 mph with gusts to 60 mph caused whiteout conditions. Drifts in Madison were as high as 7 feet. Numerous schools, businesses, and factories were shut down. Hundreds of accidents occurred and many airports were closed. Widespead power outages occurred, as well as scattered property damage. At least nine people died from heart attacks while shoveling snow.

WI004-005-006-007-008-009-010-011-015-017

Central Wisconsin

Evening-Afternoon

? 0 Heavy Snow

A broad area of snow fell across Wisconsin with reports of up to 7 inches at LaCrosse and Portage (Columbia County).

WI005-007-008-010-011-014 Central Wisconsin

Evening-Afternoon 16 17

0 0 ? 0 Heavy Snow

A swath of snow from 6 to 15 inches was deposited across central Wisconsin, from LaCrosse to Wausau to Antigo (Langlade County). Mosinee Airport in Marathon County picked up 15 inches; schools closed, numerous accidents were reported, and some power outages occurred.

		TIME	-		NO. PER	OF SONS	EST IN	ATED		DECEMBER	1990
PLACE	D A E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KTLLED	Ombac C. W.	~- .como Oxoro	OEODO	CHARACTER OF STORM		

WYOMING

WYZ011-012-016-017

Central Plains Eastern Plains

04 0900MST-2300MST

0 0 2 0 **High Winds**

Laramie Valley Southeastern Plains

Strong winds buffeted some areas of southeastern Wyoming on the 4th. A few gusts to 65 mph were logged, in and near the Laramie Range.

WYZ001-004-007 Northwestern.

1500MST-1200MST

0 Heavy Snow

Big Horn, Western Mountains

A moist Pacific storm system dumped about 8 to 10 inches of snow on the northwestern and northern mountains.

WYZ011-012-014-015-

016-017 Central Plains Eastern Plains

Red Desert Southern Mountains

2000MST-1400MST 18

0 2 0 **High Winds**

Laramie Valley Southeastern Plains

Gusts up to 65 mph raked much of southeastern and south-central Wyoming between 2000 MST on the 17th and 1400 MST on the 18th. No significant damage occurred.

WYZALL

18 0000MST-22 1800MST

0 4 Heavy Snow Bitter Cold 0 0

A major winter storm followed by a bitterly-cold Arctic outbreak, plagued most of Wyoming for about 3 to 4 days. Heavy snows with strong winds occurred on the 18th over the far western about 3 to 4 days. Heavy snows with strong winds occurred on the 18th over the far western part of the state, with up to a foot in the mountains. Light snows of 2 to 6 inches generally occurred over the rest of the state, except in the far southwest where storm totals approached 15 to 20 inches by 1800 MST on the 19th. Bitterly-cold Arctic air started spilling into the state after 1200 MST on the 18th on brisk northern winds. On the 19th and 20th, wind chills dropped to -40 to -75° at times in many areas. The coldest temperatures occurred on the 21st and 22nd, with most areas from -25 to -45°. Minus 50° readings were reported at Worland and near Jackson. Casper set an all-time record-low of -41° on the 21st. Major roads affected by the snow and winds were confined to the far west and southwest. The worst conditions occurred along Interstate 80, from Rock Springs to Rawlins on the night of the 19th and 20th where snow and strong winds closed the road, stranding many people. The bitter cold caused power outages in some places, most notably in Jackson. Schools and other events were widely canceled due to the cold weather. to the cold weather.

WYZ011-012-014-015-016-017 Central Plains Eastern Plains

Red Desert Southern Mountains Laramie Valley

Southeastern Plains

2000MST-24 1500MST

0 2 0 High Winds

Strong winds blew across much of southeastern Wyoming with gusts up to 70 mph. A few gusts of 80 to 90 mph were recorded near Wheatland and southwest of Casper. Very little damage occurred.

WYZ002-011-012-014-015-016-017 Northwest Chinook Central Plains Eastern Plains

Red Desert Southern Mountains Laramie Valley Southeastern Plains

1800MST-27 2100MST

High Winds

Quite strong winds again blew across portions of the state, from 1800 MST on the 26th to 2100 MST on the 27th. Gusts up to 60 mph occurred near Cody around 2100 MST on the 26th. Gusts of 70 to 100 mph occurred near Wheatland on the 27th, blowing over five trucks and a mobile home. Minor damage was also reported in other areas.

DECEMBER 1990

			TIME			NO. PER:	OF SONS	EST IN	AATED AGE		DECEMBER	1,7,
P	LACE	DATE	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	KTLLEED		-camoox.o	CECOEN	CHARACTER OF STORM		

WYOMING Cont'd

WYZ011-012-014-015

016-017 Central Plains Eastern Plains

Red Desert Southern Mountains Laramie Valley

31

0000MST-1800MST

0 **High Winds**

Winds of 30 to 45 mph, with gusts 60 to 75 mph, occurred at times across southeastern Wyoming from 0000 MST on the 30th, to 1800 MST on the 31st. The strongest winds blew from 0500 to 1800 MST on the 30th, with gusts up to 80 mph near Wheatland. Some minor damage to buildings and cars occurred. Southeastern Plains

ALASKA, Southeastern

Lynn Canal Glacier Bay

03

Evening-Early Morning

? O 7 O

Blizzard

AKZ013-016

Central-Southeastern Alaska and Eastern Gulf

02 Evening-03 Early Morning

? 0 Heavy Snow

A 968 mb low-pressure system moved into the north-central Gulf of Alaska. The associated A 908 mb low-pressure system moved into the north-central Guir of Alaska. The associated frontal system forced moist air over the Arctic air mass which had blanketed the eastern gulf coast, and much of southeastern Alaska for the previous several weeks. The eastern Gulf Coast, northern panhandle, and the central panhandle received occasionally-heavy snow with some storm totals between 6 and 8 inches. Strong winds resulted in blowing and drifting snow, adding to the hazardous traveling conditions. There were several minor traffic accidents in the Juneau area due to poor road conditions, but there were no serious injuries reported.

AKZ013

Coast

Central-Southeastern Alaska Early Morning-

16 17 Morning

? ? 0

Heavy Snow

A nearly-stationary Arctic front lay along the northern Gulf Coast and over central-southeastern Alaska. A 992 mb low-pressure system moved across the Gulf of Alaska to the northern coast of the panhandle. The low weakened and slowly moved over the central panhandle into British Columbia; between 9 and 14 inches of snow fell over parts of central-southern Alaska.

AKZ013

Central Southeast Alaska

Late Evening-**23** Early Afternoon

? 0

0 Ice Storm

A frontal system in the western Gulf of Alaska forced moist air across the gulf and over the Arctic air mass which was eroding over southeastern Alaska. Many locations in the central panhandle reported several hours of freezing drizzle.

?

?

?

AKZ012

Lynn Canal Glacier Bay Afternoon-

Early Morning

?

High Wind

AKZ013

Central-Southeastern Alaksa

Evening-Morning

? 0

0 **High Wind**

0

As strong Arctic high-pressure built over interior Alaska and the Yukon Territory, pressure gradients increased over southeastern Alaska resulting in very strong winds. Sustained winds as high as 60 mph were measured, as well as gusts up to 70 mph.

		TIME			NO.	OF SONS	EST I	MATED AGE		DECEMBER	1990
PLACE	D A E	LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	K-L-L-MD	-2-Damo	4-camp0200	NTOWN	CHARACTER OF STORM		

ALASKA, Southern

Yukon-Kuskokwim Delta

Bristol Bay Central Gulf Coast Kodiak Island Alaska Peninsula

01- 1200UTC

Winter Storm 02.

A strong low moved eastward across the southern Bering Sea, across the Alaska Peninsula and to near Kodiak Island by the 3rd. Southeastern winds gusted to 68 mph at Cold Bay on the 1st, and eastern winds gusted to 55 mph at Kodiak on the 1st, and to 71 mph at Middleton Island on the 2nd. With the winds, Kodiak received 15.7 inches of snow in a 24-hour period, a new December record for 24 hours. A weekend blizzard dumped 29 inches of snow on Dillingham, accompanied by winds to 40 mph. The King Salmon area reported eastern winds 40 to 55 mph with blowing and drifting snow. The Yukon-Kuskokwim Delta endured blizzard conditions and low wind-chill with northeastern winds, 40 to 60 mph and temperatures near zero.

Cook Inlet

03- 1800UTC

Flash Flood (Ice Jam)

A rare ice-jam flood occurred at freeze-up on the Kenai River, 13 miles upstream from its mouth, flooding parts of Soldotna with a foot of water.

Pribilof Islands

09 1600UTC

High Winds

A low moved eastward through the Bering Sea, passing to the south of the Pribilof Islands, giving that area strong eastern winds. Saint Paul recorded eastern winds 40 to 55 mph between 0700 UTC and 1300 UTC.

Bristol Bay Kodiak Island 12- 1800UTC

? O O **High Winds** 0

A strong 974 mb low-pressure system moved across the southeastern Bering Sea and into mainland Alaska just north of Dillingham. A tight pressure gradient on the southwestern side of the low brought southwestern winds, gusting to 58 mph at Port Heiden, 56 mph at King Salmon, and an unofficial 60 mph at Naknek. There was minor flooding of a cannery on the shore at Naknek, near the noon high tide and some boats were reported sunk. The low reformed in the northern Gulf of Alaska and the combination of this low, and building high pressure over Bristol Bay, brought northwestern winds to 40 mph with a peak gust 67 mph from 1600 UTC, to midnight on the 13th at Kodiak.

Central Gulf Coast

16- 2300UTC

0 **High Winds**

Building high pressure over interior Alaska combined with low pressure, southeast of Valdez brought strong winds blowing out of passes on the central Gulf Coast. Northern to northeastern winds were 35 mph in Valdez, with peak gusts 63 mph in the town and 60 mph at the airport. Whittier reported western winds gusting to 58 mph both days.

Cook Inlet Susitna Valley 23- 0000UTC 25

0 Heavy Snow Freezing Rain

Low pressure over the eastern Bering Sea and western Alaska brought widespread snow and freezing precipitation to the upper Cook Inlet area, and the Matanuska and Susitna Valleys. The heavy wet snow and ice brought down trees and power lines, especially in the Matanuska and Susitna Valleys, resulting in power outages affecting 4,300 customers for periods of up to a week.

Central Gulf Coast

26- 2200UTC 27

High Winds

A low formed in the northeastern Gulf of Alaska on the 26th. A tight pressure-gradient developed between the low and a building high-pressure area over the Alaska interior, resulting in local high winds through coastal passes. Valdez reported a peak gust of 75 mph on the afternoon of the 26th. Seward had northern winds gusting to 60 mph the same day, and Whittier reported southwestern gusts to 58 mph on the 26th and 27th.

PLACE

TIME

D LOCAL
STANDARD

PATH
(MILES)

D (YARDS)

D D OF ESTIMATED
PERSONS

D DAMAGE

K I P C CHARACTER
OF STORM

D STORM

HAWAII

Hawaii Oahu

18 0300HST

0 0

5

5

Flash Flooding

Heavy nighttime thunderstorms caused extensive flash flooding in the Kalihi area of Honolulu.

Hawaii

18-

0 0

0

0

Flash Flooding

Very heavy rainfall over the windward side of the Big Island caused widespread flooding and road closures.

PACIFIC

Marianas Islands Guam

20

0 0

,

Typhoon Russ

Typhoon Russ moved westward just south of Guam, but close enough to cause extensive damage (mainly) to the extreme southern part of the island. About 2,000 homes sustained mostly-minor damage.

PUERTO RICO

Puerto Rico

29 Afternoon

0 0

5

0 Landslide

An upper trough and strong high pressure triggered heavy rains and gusty winds, causing several families from Colinas de Monte Carlo urbanization in Rio Piedras, to relocate to shelters, as their houses were threatened by landslides from the heavy showers. Seven houses sank or cracked and the only road collapsed. The slide knocked down light and telephone posts, damaged sewer lines, and caused 30- to 40-feet soil cracks. No fatalities were reported.

VIRGIN ISLANDS

None reported.

PLACE

TIME

LOCAL
LENGTH
OF PERSONS
DAMAGE

VIDTH
OF PERSONS
CHARACTER
OF STORM

CMILES)

VARDS)

DECEMBER 1990

CORRECTIONS

MARCH 1990

NEW YORK, Central - Page 82

Areawide

20 AM 20 PM

1 38 6 0 Snow

... They were continuing to search for a missing 12-year-old girl in a heavily wooded section of the county.

Insert:

She was found unharmed about 30 minutes later.

APRIL 1990

NEW YORK, Central - Page 61 - Delete

Ulster County Town of Lloyd

vd 01 1135CST

1 0 ? ? Fog

Dense fog over Illinois Mtn. in the town of Lloyd was listed as the cause of a fatal plane crash.

ADDITIONS

AUGUST 1990

NEW JERSEY, Northern - Page 95 - Add

Sussex County Passaic County

Fredon to Upper Greenwood Lake 13 1835EST-1903EST

150

25

0 0

?

Tornado (F0)

A tornado touched down at Fredon in Sussex County. Moving northeast at approximately 60 mph, it is believed to have remained on the ground for the better part of its 25-mile-long track to Upper Greenwood Lake in extreme northwestern Passaic County. Along its path many trees were downed and topped. Several cars and homes were also damaged.

?

STORM SUMMARY - Page 161 - Add:

Under New Jersey - Tornadoes

Number 1
Days 1
Deaths 0
Injuries 0
Property Damage ?
Crop Damage ?

STORM DAMAGE CATAGORIES

REFERENCE NOTES

l Less than \$50 2 \$50 to \$500 3 \$500 to \$5,000 4 \$5,000 to \$50,000 5 \$50,000 to \$500,000 6 \$500,000 to \$5 Million 7 \$5 Million to \$50 Million 8 \$50 Million to \$500 Million 9 \$500 Million to \$5 Billion	0/Blank * ** @ # * * * o/c	None reported. Miles instead of yards. Yards instead of miles. Includes heavy sleet storm. Freezing drizzle and freezing rain, commonly known as glaze. Report incomplete. Report not received. Indicates Crop Damage amount is included in the value given for property damage.
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When reports are not received or are incomplete, the Storm Summary National Death and Injury totals may also be incomplete.

<u>Definition of Fujita Tornado Scale (F scale)</u>

(FO) Gale tornado (40-72 mph): Light damage Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage sign boards.

(F1) Moderate tornado (73-112 mph): Moderate damage The lower limit (73 mph) is the beginning of hurricane wind speed; peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads.

(F2) Significant tornado (113-157 mph): Considerable damage Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.

(F3) Severe tornado (158-206 mph): Severe damage Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown.

(F4) Devastating tornado (207-260 mph): Devastating damage Well-constructed houses leveled; structure with weak foundation blown off some distance; cars thrown and large missiles generated.

(F5) Incredible tornado (261-318 mph): Incredible damage Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100 m; trees debarked; incredible phenomena will occur.

(F6-F12) (319 mph to Mach 1, the speed of sound): The maximum wind speeds of tornadoes are not expected to reach the F6 wind speeds.

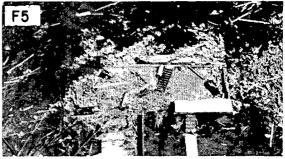
(F0+F1) Weak Tornado (F2+F3) Strong Tornado (F4+F5) Violent Tornado

From J. Atmos. Sci., August 1981, p. 1517-1519



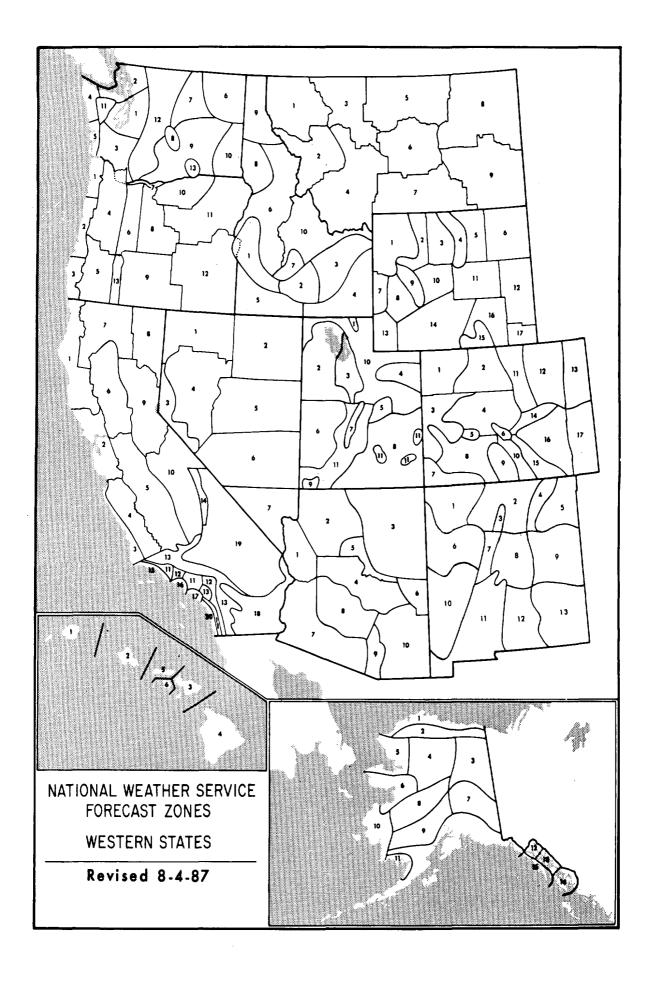


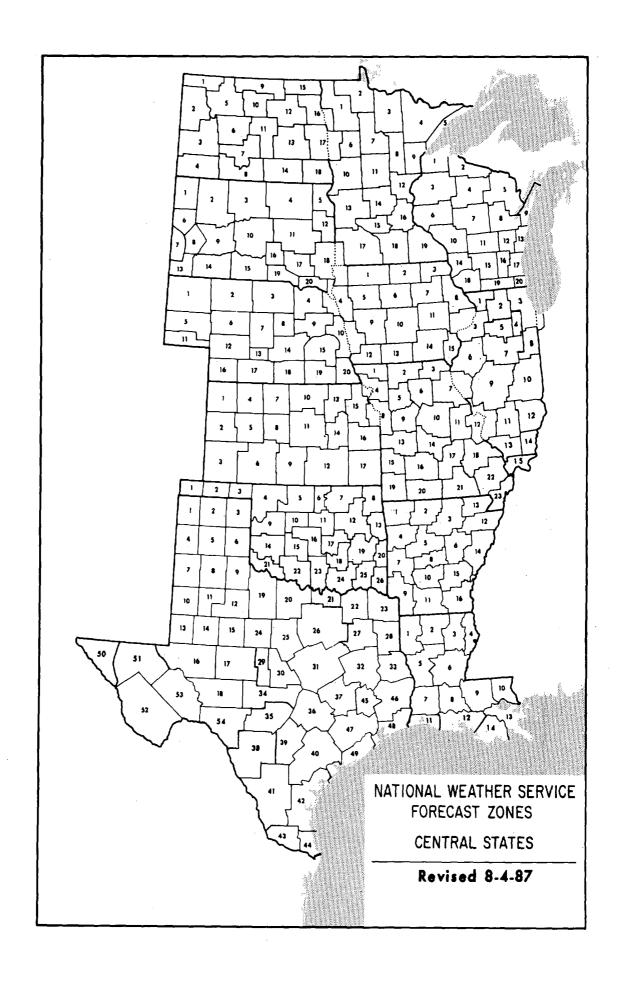


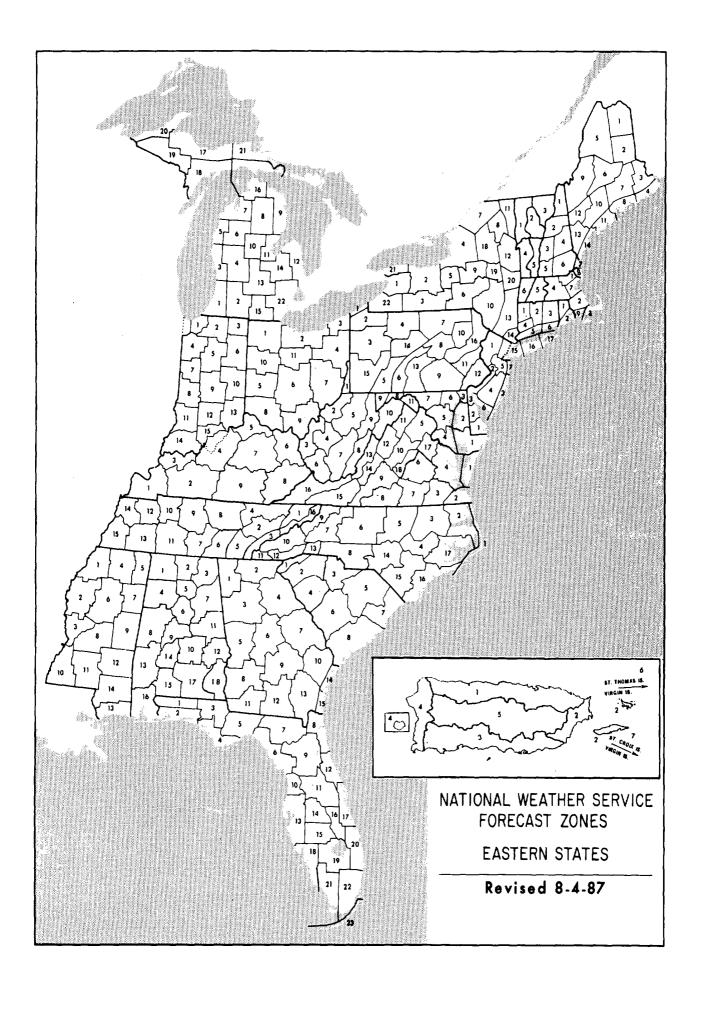


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NATIONAL SUMMARY OF TORNADOES, 1990

JAY HOLLIFIELD NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE NATIONAL CLIMATIC DATA CENTER

The 1990 tornado season began on January 16th at 9:20 p.m. when a tornado struck a residential area in the city of Pico Rivera, Ca. There were nine homes with roof damage and one home lost about one-third of its shingles. There were 1132 tornadoes in 181 days, which killed 53 people and injured 1177. Tornadoes destroyed or damaged more than 600 mobile homes which resulted in nine deaths and several injuries. There was no tornado activity reported in Alaska, Hawaii, Maine, New Hampshire, Oregon, and Vermont. Location of killer tornadoes, new monthly records since 1953 by state, and state-to-state border crossings are shown in the following three tables:

TABLE I. LOCATION OF KILLER TORNADOES

<u>DATE</u>	STATE	COUNTY	TOTAL DEATHS
February 9	Mississippi	Madison	1
March 13	Kansas	Harvey	1
March 13	Kansas	Marion	1
March 14	Arkansas	Dallas	1
May 4	Ohio	Butler	1
May 4	Virginia	Augusta	2
May 15	Oklahoma	Payne	1
May 16	Arkansas	Clay	1
June 1	Texas	Pecos	2
June 2	Illinois	Edwards	1
June 2	Indiana	Putnam	1
June 2	Indiana	Lawrence	1.
June 2	Indiana	Pike	6
August 28	Illinois	Will	29
October 18	Virginia	King William	1
October 22	South Carolina	Calhoun	1
December 21	Mississippi	Humphreys	1
December 21	Mississippi	Carroll	1
			53

TABLE II. NEW MONTHLY RECORDS (SINCE 1953)

<u>MONTH</u>	STATE	RECORD	<u>PREVIOUS</u> <u>RECORD (YEAR)</u>
January	Nevada	1	0
February	Alabama	11	6 (1971)
	Georgia	11	10 (1971)
	Louisiana	8	7 (1974)
	Pennsylvania	1	0
	South Carolina	5	3 (1989)
March	Iowa	17	5 (1988)
	Kansas	23	20 (1954)
	Nebraska	15	2 (1975)
April	Utah	1	0
May	Maryland	5	2 (1974)
	Wyoming	23	11 (1978)
June	Colorado	33	16 (1965)
	Indiana	44	30 (1973)
	Iowa	36	18 (1969)
	Kentucky	15	7 (1973)
	Nebraska	39	35 (1967)
August	Idaho	3	1 (1956)
	New Mexico	6	5 (1966)
	New York	.7	3 (1973)
	Utah	1	0
September	Michigan	10	5 (1974)
October	Maryland	3	1 (1965)
	New Jersey	4	1 (1967)
	New York	2	1 (1986)
	Rhode Island	1	0
	Tennessee	2	1 (1955)
	Virginia	5	2 (1979)

TABLE III. STATE-TO-STATE BORDER CROSSINGS

<u>DATE</u>	<u>STATE</u>		<u>STATE</u>
March 13	Oklahoma	into	Kansas
March 13	Iowa	into	Illinois
June 2 (1653)	Illinois	into into into into into into into into	Indiana
June 2 (1720)	Illinois		Indiana
June 2 (1745)	Illinois		Indiana
June 2 (1829)	Illinois		Indiana
June 2	Indiana		Ohio
June 2	Indiana		Kentucky

The first tornado of 1990 struck a residential area in the city of Pico Rivera, CA on January 16th at 9:20 p.m. There were nine homes with roof damage and one home lost about one-third of its shingles.

A tornado (F3) occurred on January 19th at 3:40 p.m. at Apple Springs, TX. One mobile home was overturned and moved 70 feet off its foundation, 20 homes were damaged, and seven homes were heavily damaged. The tornado entered Angelina County 10 miles west of Lufkin before dissipating at Hudson. Two persons were injured in a mobile home at Hudson. The damage at Hudson alone was estimated at \$484,000.

A tornado touched down on January 25th at 5:50 a.m., 6 miles northwest of Luverne, AL. There were 28 injuries, three were serious. Damage estimates were placed at \$2 million.

A tornado touched down on February 3rd at 7:48 p.m., about 6 miles north of downtown Birmingham, AL. The tornado moved eastward through sections of Fultondale, Walker's Chapel, and Coalburg. A house and a mobile home were totally destroyed. Approximately 50 homes received major damage and near 100 received minor damage. Three churches and a shopping center were heavily damaged. There were no deaths but 15 people received minor injuries, mostly from flying glass. Damage was estimated at near \$3 million.

Seven tornadoes occurred on February 3rd in Alabama. The estimated dollar loss was over \$6.5 million.

A tornado (F2) touched down briefly 6 miles south of Shelby, NC on February 10th at 9:00 a.m. Twelve houses were damaged; three were severely damaged. One mobile home was destroyed and three were damaged.

There were 17 tornadoes reported in Iowa in March; nine occurred on the 13th. The most damaging one (F3, F4) occurred at 4:53 p.m. to 5:25 p.m. in Linn, Jones, Dubuque and Delaware counties. The tornado was on the ground for over 30 minutes, causing millions of dollars in damage. The hardest hit area was in western Dubuque County in the city of Worthington. Twenty-six homes and businesses were damaged; 13 were destroyed.

A strong tornado occurred on March 13th in Reno, Harvey, McPherson, and Marion counties in Kansas. The tornado began near Pretty Prairie (Reno County) at 4:34 p.m. as a weak tornado, but began its continuous damage 3 miles south of Casleton and continued on the ground across Harvey County. Damage in Reno County was \$1.5 million. Twenty homes and farms were destroyed, but only one injury was reported. The tornado entered Harvey County 8 miles southwest of Burrton. The tornado reached a peak strength of F5 in Harvey County. A 6-year-old boy was killed when a chimney toppled onto him. He and his family were in the basement seeking safety from the storm. This was the first fatality for Kansas in 1990. Total damage in Harvey County was \$20.2 million. A second death occurred near Goessel, KS when a 65-year-old woman was killed in her home.

There were 15 tornadoes reported in Nebraska in March. All of them occurred on the 13th. Fortunately, there were no deaths, but there were eight injuries. There were millions of dollars in damage.

Oklahoma reported 10 tornadoes in March. These also occurred on the 13th. There were no deaths but there were three injuries reported. Many mobile homes, homes, and barns were destroyed or damaged.

A tornado ripped through the east and southeast sections of Fordyce, AR on March 14th at 7:40 p.m. The tornado damaged 50 homes, two businesses and one school. One mobile home was carried a block through the air before it came crashing to the ground. Two men were injured in the mobile home; one died two days later. A third occupant was a six-week-old baby girl. Miraculously, the baby was found amidst the debris, lying face down in the mud, with only minor injuries.

A meso-cyclone thunderstorm developed March 29th over Terrebonne Parish, LA. The thunderstorm spawned a tornado which struck a mobile home park near Gray, LA. Fifteen mobile homes were destroyed and 15 others suffered heavy damage. Seven people in the mobile home park were injured; one seriously.

A tornado touched down 2 miles south of Lone Grove in Carter County, OK on April 9th at 11:10 p.m. and moved east-northeast for 11 miles. Five mobile homes were destroyed, several permanent homes were damaged, and a farm implement building was destroyed. There were four injuries; all occurred in mobile homes.

Thunderstorms produced two tornadoes on April 24th in Oklahoma. An F2 tornado touched down 8 miles south-southwest of Arnett and moved north-northeast, hitting the town of Shattuck at 9:48 p.m. and dissipated 11 miles northeast of Shattuck. Damage was continuous from 6 miles south of Shattuck to 0.75 miles north of Shattuck. Ten buildings were destroyed, 17 buildings had major damage, and 41 had minor damage. Three mobile homes and several outbuildings were destroyed. There were five reported injuries. Total damage was estimated at \$1.5 million dollars. Later the same evening an F1 tornado touched down in open country southwest of Tyrone, OK but produced no known damage.

A tornado (F4) touched down at 3:44 p.m. on April 25th 2 miles northwest of Weatherford, TX. The tornado destroyed eight mobile homes and two well-constructed homes. Fifteen mobile homes were damaged, two homes and several barns had their roofs blown off, several outbuildings were destroyed, and an automobile was lifted and placed vertically atop another automobile.

There were 56 tornadoes reported in Texas in April. There were nine injuries and the estimated damage was more than \$500 million.

A tornado occurred May 4th at 7:22 p.m. in Augusta County, VA. The tornado cut a path southwest through northeast through Augusta Springs, injuring seven people and causing extensive damage. Trailers and weaker

structures were demolished; a 100-year-old church was lifted off its foundation; buildings were unroofed and lost windows. Large trees were uprooted or snapped off. The tornado lifted on the east side of Augusta Springs. The tornado re-formed on the east side of a ridge 2500 feet high, crossed a hill and hit a mobile home near the community of Swoope, killing two occupants and injuring three. Augusta County officials estimated the damage near \$790,000.

A tornado moved through the Cindy Mobile Home Park just west of Blue Ball, OH on May 4th at 7:50 p.m. Seven mobile homes were destroyed and ten were damaged. There was one death and five injuries caused by this storm.

An outbreak of severe thunderstorms and tornadoes across much of central and northern Oklahoma on May 15th produced hail up to 4.75 inches in diameter, wind damage, and six tornadoes. The most destructive tornado touched down 4 miles west of Stillwater at 6:41 p.m. and moved east through northeast into northern parts of the city causing extensive damage. Two apartment complexes were heavily damaged, nine homes were destroyed, and 74 had extensive damage. Two-hundredseventy homes received minor damage. Two businesses were destroyed and 12 others were damaged. Seven mobile homes were destroyed and seven were damaged. A 4-year-old Stillwater boy died when he and his mother attempted to drive to a friend's house for shelter. The pickup truck in which he was a passenger was struck by flying debris from nearby homes. There were 12 injuries from the tornado. Total damage was estimated at \$4 million.

A tornado occurred May 20th at 9:20 p.m. in Greene County, MO. The tornado touched down first in southeast Greene County near Highway 125 and US 60, and moved east-northeast along a 12-mile path to Rogersville and lifted near Fordland. Most of the damage was along a 5-mile path in Rogersville near US 60. A 6-year-old-boy and his 6-month-old brother were seriously injured. They were in a mobile home at the time. There were seven minor injuries reported. There were 18 mobile homes and one house destroyed. Two houses received heavy damage and 16 homes received minor damage. More than 20 businesses were damaged. More than \$2 million damage was caused by this storm.

A tornado (F3) occurred on May 24th at 4:10 p.m. in Barton County, KS. The tornado caused over \$500,000 in damage to Barton County. Four men were injured when the tornado struck an oil rig. The men tried to escape in a car, but the car was lifted and rolled several

times. Two of the men were taken to the hospital. The tornado destroyed one home and damaged three others as it traveled parallel to Highway K-4. It blew 88 cars of a 125-car train off the track and stacked them three and four cars high. A woman working in a cemetery south of Claffin also tried to outrun the storm in her pickup truck. She was injured when she was "sucked out" of her truck and thrown into a ditch. She described the storm as a "huge black wall" and stated that at one time she was "airborne, trying to run but my feet wouldn't touch the ground". She also saw a live deer "flying through the air". The tornado moved into Ellsworth County at 4:35 p.m. and intensified to F4. The tornado ripped 70 power poles and damaged several farm homes. One house was blown off its foundation. There were six people inside the house, but none were injured. The tornado destroyed 12 homes west of Bushton and machinery was rolled into unidentifiable piles of metal. Damage in Ellsworth County was \$1.5 million. The tornado entered Rice County at 4:50 p.m. with the intensity of an F3. The damage in Rice County was \$1 million. The tornado moved into McPherson County at 5:20 p.m. The damage in McPherson County was \$1.5 million. The tornado moved into Marion County at 7:45 p.m. The damage in Marion County was \$1.4 million. This tornado's length was 115 miles and lasted more than 3 hours. There were no deaths, but there were six reported injuries caused by this storm.

A violent long-track tornado occurred June 1st in Pecos The tornado was accompanied by grapefruit-size hail. The tornado touched down at 4:20 p.m., 10 miles southwest of McCamey and moved slowly east-southeast, producing intermittent F0 damage for the first 2 to 3 miles. The tornado grew rapidly in size and intensity as it approached Farm-to-Market Road (FM) 1901. F3 damage was inflicted on an agricultural co-op building. The damage path increased to roughly 1.3 miles as the tornado reached F4 intensity. A newly constructed two-story adobe brick house was levelled and a 1/2-milewide swath of vegetation was completely scoured. Two miles downstream, a 300-foot section of asphalt was removed from the highway along the tornado's path. The tornado weakened to F2 intensity, but became a killer. A man driving a dump truck and a family of four in a pickup truck were among the many people caught on the road as the tornado approached. The dump truck driver and the father of the family in the pickup truck were killed as their vehicles were swept 400-600 feet off the road. The tornado increased to F4 intensity as it approached US 190. Two oil storage tanks, full with 500 barrels of oil and weighing 70 tons each, were wrenched from their tank battery, rolled 3 miles across a field, and pushed 600 feet up the side of a mountain. Fifty-seven oil field pumps were damaged or destroyed by the tornado, before it lifted 5 miles southwest of Iraan at 5:30 p.m. Total damage from the tornado was estimated at \$30-40 million.

A tornado (F4) occurred in Wayne, Clay, and Richland counties, Illinois on June 2nd. The tornado first touched down at Illinois Route 45 and Rinard crossroads at 4:45 p.m. where a mobile home was destroyed and power lines downed. Two occupants of a pickup truck were injured as a tree fell on the truck. The tornado moved northeast and rolled four large oil tanks (30-50 thousand gallons) across a field. The tornado was south of Clay City at 4:55 p.m. where two mobile homes were thrown 200 feet and disintegrated. The tornado destroyed another home 1 mile south of Olney, IL before lifting back into the clouds.

A tornado (F4) touched down north of Aden in Hamilton County, IL on June 2nd at 5:20 p.m. The tornado overturned a truck and littered the highway with trees. It reached Barnhill, Wayne County at 5:30 p.m., destroyed 10 homes and damaged 24 others. One minor head injury was experienced by a man as a mobile home was disintegrated. The man saw the tornado out his bedroom window and held onto his mattress for safety as he lost consciousness. He regained consciousness about 100 feet away, still on top of his mattress. The tornado continued moving northeast, damaging a church, and other homes and structures. The tornado reached Albion, Edwards County at 6:04 p.m. and destroyed the Luber-Finer Plant and many other homes and structures. A lady who was an occupant of a destroyed home in Browns, IL was thrown 40 feet and was found dead with part of the home on top of her. Extensive damage was done to Wabash Valley College and 17 homes. The tornado crossed the Wabash River at 6:29 p.m. and skipped across Indiana another 51 miles for a total length of 94 miles.

A tornado touched down 2 miles west of Union, IN on June 2nd at 8:17 p.m. A house was blown 30 feet off its foundation, but left intact. A house across the street was totally disintegrated; killing both occupants. The tornado moved east-northeast leaving a well-marked path through wooded areas just south of Bowman and parallel to S.R. 56. The tornado struck Petersburg at 8:40 p.m. destroying a nursing home, an apartment complex, and eight to ten homes. Three people were killed in this area. A woman in Petersburg was severely injured and later died. The tornado moved through the business district where 19 businesses were destroyed. The tornado moved into a residential area destroying another 168 homes and damaging over 400. The elementary

school on the southeast side of town was also damaged. This was Indiana's deadliest storm since the super outbreak of April 3rd, 1974.

A small but powerful tornado (F2) touched down on July 1st at 6:15 p.m. about 3 miles east of Lisbon in Bladen County, N.C. The tornado moved to the southeast and remained on the ground for about one-half mile. Trees were snapped off and uprooted along the path. A roof was blown off a house and a mobile home was destroyed. Bricks from the house were carried about one-quarter mile and smashed through the mobile home.

A tornado struck Onieda County, NY on July 23rd at 10:23 a.m. The tornado was intermittent with a total path length of 17 miles. The initial touchdown in Verona was rated as an F0. The tornado next touched down near Griffiss Air Force Base. Again the tornado was rated an F0. The final segment of the tornado occurred near the community of Holland Patent. Here the tornado destroyed a school garage and a private home. Damage along this segment was rated as an F2.

A large, killer tornado spun a path of destruction across Kendall and Will counties in Illinois late in the afternoon of August 28th. This unusual, late August tornado killed 29 people and seriously injured at least 350. It caused an estimated \$165 million damage. The tornado first touched down at Oswego at about 2:30 p.m. and moved southeast, crossing the Kendall-Will County border 6 miles south of their northern borders, and lifted at about 2:50 p.m. in Joliet. The damage path was 16.4 miles long and ranged from 200 yards to one-half-mile wide.

The first 4 miles the tornado was F1 and F2. It became F3 across Wheatland Plains where it destroyed 12 homes and damaged 50. Total damage was more than \$9.2 million. The tornado reached maximum intensity F5 as it approached Plainfield, where it destroyed two large steel electric transmission towers and destroyed others. It then destroyed the Plainfield High School with F3 intensity, where double brick and concrete block walls were demolished, and 2300 pound concrete blocks were toppled. The football team was practicing and took shelter just before the tornado struck. The tornado killed six people in Plainfield, destroyed 55 homes and damaged 205. Grand Prairie Elementary School and District Administrative Center were destroyed, for a total estimated loss of \$60 million. Three people died at Saint Mary Immaculate and \$6 million in damage was done to the church, school, rectory, and convent.

For the next 4 miles the tornado continued at F3 and F4 intensity. Along Illinois Route 59 several shopping malls

were damaged (\$3.5 million). Seventy-five homes were destroyed at Peerless Estates and 148 homes were damaged (\$15.4 million). One person died at Lily Cache, 55 homes were destroyed and 127 homes damaged (\$11.5 million). Two people died at Crystal Lawns, 69 homes were destroyed and 324 damaged (over \$15 million). The tornado killed two people at Warwick Estates, destroyed 50 homes, and damaged 31 homes (over \$6 million). It killed eight people at Crest Hill Lakes, (some of whom were thrown into corn fields from their apartments), destroyed three buildings containing 100 apartments, and did over \$5 million damage.

The surprise factor was great with this tornado because a powerful thunderstorm was in progress with low cloud bases, and its early stages were masked by the preceding downburst. Eyewitness accounts testify to abrupt and complete devastation. People were unable to communicate the danger to others until it was too late.

Clusters of severe thunderstorms produced hail up to baseball size over portions of northwest Wisconsin and generated four tornadoes in Barron County in the evening of September 11th. A tornado touched down 6 miles west of Rice Lake and destroyed a farm and mobile home with damages over \$300,000. A second tornado caused trailer and tree damage east of Cumberland. The third and most destructive tornado hit Canton causing almost \$1 million in damage to 28 homes and buildings.

A strong tornado (F3) occurred September 14th at 1:10 p.m. in Oakland County, MI. Many homes, businesses, and cars were badly damaged. Windows were blown out of store fronts. Walls of several stores and homes were blown down, and roofs were lifted off homes and businesses. Total damage was estimated near \$2 million.

A tornado (F3) touched down October 18th at 4:00 p.m. in King William County, VA. Its path was 1/4-mile wide at its maximum. A 73-year-old man lost his life in the Mount Olive section when the barn under which he took shelter, collapsed on him. At least three homes were heavily damaged along with several outbuildings, and great numbers of trees were destroyed.

A tornado touched down briefly October 22nd at 5:50 p.m. near St. Matthews, SC. The tornado injured four people, and killed an 11-year-old girl. The tornado destroyed three mobile homes, two sheds, one room of a brick house, and one small concrete building.

A tornado (F1) struck a football stadium during a game November 9th at 4:15 p.m., 2 miles north of Sanford, FL. A coach was blown off the top row of the bleachers, and suffered injuries which were serious enough to require hospitalization. Several fans suffered minor injuries from flying debris.

A tornado (F3) occurred on November 27th at 11:20 a.m. in Columbia, MO. About 30 homes were destroyed or damaged. A pickup truck and garage were lifted and dropped into another yard. A shopping center received major damage. Roofs were blown off of four apartment complexes. Three injuries occurred at the four apartment complexes around Broadway and Stadium Drive, where 150 people were left homeless.

A tornado (F2) touched down on November 27th at 2:53 p.m. near Ofallon, MO. Damage was extensive in locations. The damage included a large apartment complex, a publishing company, and the destruction of six businesses and four houses. The damage estimated from the tornado and thunderstorm winds that accompanied the tornado was \$20 to \$30 million.

A total of 19 tornadoes occurred in December in the state of Louisiana. They occurred on the 3rd, 20th, and 21st. Seven people were injured by these tornadoes, but fortunately, no one was killed.

A tornado (F3) touched down near Bowling Green in Holmes County, MS on December 21st at 4:50 p.m. From the time the tornado touched down until it crossed Interstate 55, it traveled through mostly wooded and sparsely-populated areas. It cut a distinct path through the wooded areas that varied from one-quarter to one-half mile wide. Thousands of trees were snapped off or blown down. When the tornado crossed Interstate 55, it blew several cars off the highway and overturned a tractor-semitrailer. The tornado entered the extreme southwest corner of Vaiden at 5:12 p.m. Fifty-five homes and mobile homes were destroyed, 29 homes had major damage, and 60 homes had minor damage. Fifteen people were injured in Vaiden, and one 12-year-old girl was killed in a mobile home northeast of Vaiden.

The final reported tornado of 1990 touched down at 11:25 a.m. on December 30th, 8 miles southwest of Parkdale, AR. Several trees were downed on the southwest part of town. One tree fell on and destroyed a garage and car. The tornado then moved down Main Street, damaging at least 13 buildings. Thirteen railroad cotton trailers were damaged; five were destroyed beyond recognition. Total path length was about 10 miles, with a maximum width of 100 yards. Damage in Parkdale has been estimated at \$250,000.

More detailed information concerning tornado activity can be obtained from the monthly Storm Data publications. The National Severe Storms Forecast Center has generated a magnetic tape which contains tornado statistics for the period 1950-1990. A copy of that tape can be obtained by contacting the National Climatic Data Center, Federal Building, Asheville, North Carolina 28801-2696 (Telephone: (704) 259-0682).

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ALABAMA NUMBER DAYS DEATHS INJURIES		1 1 0 28	11 . 4 . 0 46	3 1 0	0 0 0	2 2 0 0	0 0 0	0 0	0 0 0	0 0 0	1 0 0	0 0 0	1 1 0	19 10 0 74
ARIZONA NUMBER OAYS THABD INJURIES		0 0 0	0000	0 0 0	0000	0 0 0	0 0 0	2 0 0	0 0 0	1 1 0 0	0 0 0	0 0 0 0	0000	3 3 0 0
ARKANSAS NUMBER DAYS DEATHS INJURIES		0 0 0	2 2 0 0	3 1 1 6	0 0 0	9 3 1 2	4 2 0	0 0 0	0000	1 1 0	0 0 0	0000	1 1 0 0	20 10 2 8
CALIFORNIA NUMBER DAYS DEATHS INJURIES		2 0 0	0 0 0	0 0 0	1 1 0 0	0 0 0	0 0	0 0 0	1 1 0	1 1 0	0 0	0000	0000	5 5 0
COLORADO NUMBER DAYS DEATHS INJURIES		. 0000	0 0 0	0000	1 1 0 0	5 3 0	33 8 0 16	12 5 0	4 3 0 0	0 0 0	0 0 0	0000	0000	55 20 0,
CONNECTICUT NUMBER DAYS DEATHS INJURIES		0000	0000	0000	0 0 0	0 0	1 1 0. 7	0	0 0 0	0 0 0	0 0 0	0000	0000	1 . 1 0 7
DELAWARE NUMBER DAYS DEATHS INJURIES		0000	0000	0000	0000	0 0 0 0	0000	0000	0000	0000	1 ; 1 0 0	0 0 0	0000	, 1 1 0 0
FLORIDA NUMBER DAYS DEATHS INJURIES		0 0 0 0	2 2 0 0	0 0 0 0	1 1 0	6 3 0	1.6 1.1 0	15 10 0	4 4 0 0	5 4 0	3 2 0 0	4 1 0	00,00	56 38 10
GEORGIA NUMBER DAYS DEATHS INJURIES		2 0 6	1 1 3 0 1 6	0 0 0	1 1 0 0	3 2 0	0000	0 0 0	· 0 · · · · · · · · · · · · · · · · · ·	. 0000	1 1 0 0	0 0 0 0	0000	1 8 9 0 2 2
IDAHO NUMBER DAYS DEATHS INJURIES		0 0 0	00.00	0000	1 1 0 0	0000	2 2 0 0	2 2 0 0	3 1 0	1 1 0 0	0000	0000	0000	9 7 . 0 0
ILLINDIS NUMBER DAYS DEATHS INJURIES		0 0 0	0 0 0	2 2 0 1	0 0 0	9400	26 8 1	0 0 0	2 1 29 350	1 1 0 0	3 1 0 0	7 2 0 2	0000	50 19 30 365
INDIANA NUMBER DAYS DEATHS INJURIES		0000	0000	0000	1 1 0	1 1 0	44 5 8 220	0 0 0 0	2 1 0 0	0000	1 0 0	0 0 0	0000	49 9 8 220
IOWA NUMBER DAYS DEATHS INJURIES		0 0	0 0 0	17 3 0 16	1 1 0	1 1 0	-36 10 0	7 4 0 0	9.600	. 0000	0 0 0	. 0 0 .	0 0 0	71 25 0 16
KANSAS NUMBER DAYS DEATHS INJURIES		0 0 0	0000	23 4 2 61	8 8 8	28	25 8 0 19	3 1 0 0	1. 1 0	0 0 0	0000	. 0000	0000	88 25 2 86

· · · · · · · · · · · · · · · · · · ·	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ост	NOV	DEC	ANN
KENTUCKY NUMBER DAYS DEATHS INJURIES	0000	0000	0 0 0	0 0 0 0	4 2 0 1	.15 3 0 6	0 0 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0000	1 9 5 0 7
LOUISIANA NUMBER DAYS DEATHS INJURIES	1 1 0 0	8 2 0 5	6 3 0 7	14 2 0	15 6 0	1 1 0 0	3 2 0 0	1 1 0 0	3 2 0 0	1 1 0 0	0 0 0	19 3 0 7	72 24 0 20
MARYLAND NUMBER DAYS DEATHS INJURIES	0 0 0	0 0 0	0000	0 0 0	5 2 0 2	1 1 0	1 1 0 0	0 0 0	0 0 0	3 1 0 60	0000	0000	10 5 0 62
MASSACHUSETTS NUMBER DAYS DEATHS INJURIES	0 0 0	0000	0000	0 0 0	2 1 0	0 0 0	0 0 0	1 1 0 0	0 0 0	0 0 0	0 0 0	0 0 0	3 2 0
MICHIGAN NUMBER DAYS DEATHS INJURIES	0000	0 0 0	0 0 0	0 0 0	0 0 0	5 3 0	4 3 0 0	1 1 0	1 0 2 0	1 1 0	0 0 0	0000	21 10 0
MINNESOTA NUMBER . DAYS DEATHS INJURIES	0 0 0 0	0 0 0	0 0 0	2 1 0 0	0 0 0	6 5 0	2 2 0 0	1 1 0 0	1 1 0 0	0 0 0	0 0 0	0 0 0	1 2 1 0 · 0
MISSISSIPPI NUMBER DAYS DEATHS INJURIES	0 0 0	5 ' 3 1 4	0000	3 1 0 0	2 2 0 6	0 0 0	0000	0000	0 0 0	1 1 0 2	0000	12 3 2 16	23 10 3 28
MISSOURI NUMBER DAYS DEATHS INJURIES	000	2 1 0	4 2 0	0000	10 7 0	9 2 0	0 0 0	1 0 0	0 0 0	0 0 0	5 1 0 33	0 0	31 14 0 45
MONTANA NUMBER DAYS DEATHS INJURIES	0 0	0 0 0	0 0 0	0 0 0	3 1 0	1 1 0 0	1 1 0 0	1 1 0 0	0 0 0	0 0 0	0 0 0	0 0 0	6 4 0 0
NEBRASKA NUMBER DAYS DEATHS INJURIES	0 0 0	0 0 0	15 1 0 8	1 1 0 0	23 3 0	39 5 0	6 4 0 0	4 2 0 0	0 0 0	0 0 0	0 0 0	0 0	88 16 0
NEVADA NUMBER DAYS DEATHS INJURIES	1 1 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0000	0 0 0	0 0 0	0 0 0	0 0 0	1 1 0 0
NEW JERSEY NUMBER DAYS DEATHS INJURIES	0 0 0	0 . 0 0	0 0	0 0 0	2 1 0	0 0	0000	1 1 0 0	0 0 0	4 1 0 11	0 0 0	0 0 0	7 3 0 11
NEW MEXICO NUMBER DAYS DEATHS INJURIES	0 0 0	0 0 0	0 0 0	3 2 0 0	1 1 0 0	0 0 0	5500	0000	1 1 0 0	0000	0 0 0	0 0 0	16 11 0
NEW YORK NUMBER DAYS DEATHS INJURIES	0 0 0	0 0 0	0 0 0	1 1 0	1 1 0	4 3 0 0	1 1 0 0	7 2 0 8	0 0 0	2 2 0 1	0 0 0	0 0 0	16 10 0

								1			T		
	JAN	FEB	MAR	APR	MAY	NUL	JUL	AUG	SEP	ОСТ	NOV	DEC	ANN
NORTH CAROLINA NUMBER DAYS DEATHS INJURIES	1 1 0 0	3 1 0	0 0 0	1 1 0 0	3 3 0 1	1 1 0 0	1 1 0 0	0 0 0	1 1 0 0	4 2 0 2	2 2 0 1	0 0 0	17 13 0 4
NORTH DAKOTA NUMBER DAYS DEATHS INJURIES	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 4 5 0 1	1 0 4 0 3	1 1 0 0	0 0 0	0 0 0	0000	0 0 0 0	25 10 0 4
OHIO NUMBER DAYS DEATHS INJURIES	0 0 0 0	0 0 0 0	0 0 0	0 0 0	3 2 1 5	8 3 0 18	8 3 0	0 0 0	4 3 0 6	0 0 0	0 0 0	1 1 0 0	24 12 1 29
OKLAHOMA NUMBER DAYS DEATHS INJURIES	0 0 0	0 0 0	10 1 0 3	3 3 0 9	10 2 1 20	6 1 0	1 1 0 0	0 0 0	0000	0000	0 0 0 0	0000	30 8 1 32
PENNSYLVANIA NUMBER DAYS DEATHS INJURIES	0 0 0	1 1 0 0	0 0 0	0 0 0 0	2 1 0 0	3 2 0	8 - 4 0 0	1 1 0 0	4 1 0 0	0 0 0 0	0 0 0 0	0 0 0	1,9 1 0 0 1
RHODE ISLAND NUMBER DAYS DEATHS INJURIES	0000	0000	0 0 0	0 0 0	0 0 0	0 0 0	0000	0 0 0	0 0 0 0	1 1 0 0	0 0 0	0 0 0	1 1 0 0
SOUTH CAROLINA NUMBER DAYS DEATHS INJURIES	0 0 0	5 2 0 1	0000	3 1 0 4	1 1 0 0	0 0 0	0000	2 2 0 0	0 0 0	1 1 1 4	0 0 0	0 0 0	1 2 7 1 9
SOUTH DAKOTA NUMBER DAYS DEATHS INJURIES	0000	0000	0 0 0	0 0 0	1 1 0 0	9 4 0	0 0 0	1 1 0 0	0 0 0	0 0 0	0 0 0	0000	1 1 6 0
TENNESSEE NUMBER DAYS DEATHS INJURIES	0000	3 1 0	0 0 0	1 1 0 0	2200	1 1 0	1 1 0 0	0000	0 0 0	2 1 0	0000	0 0 0	1 0 7 0
TEXAS NUMBER DAYS DEATHS INJURIES	3 1 0 3	3 3 0 1	4 2 0 0	56 90 9	62 12 0 22	20 4 2 21	5 2 0 6	2 2 0 0	3 3 0 0	0000	0 0 0	0 0 0	158 38 2 62
UTAH NUMBER DAYS DEATHS INJURIES	0 0	0 0 0	1 0 0	1 1 0	0000	0000	1 1 0 0	1 0 0	0000	0000	0000	0000	4 4 0 1
VIRGINIA NUMBER DAYS DEATHS INJURIES	0000	1 1 0	0000	4 2 0 1	3 2 10	0000	4 4 0 0	0000	0000	5 1 1 2	0 0 0	0000	17 10 3 13
WASHINGTON NUMBER CAYS DEATHS INJURIES	0 0 0	0	0000	0000	0000	0000	0 0 0	0000	0000	0000	0000	1 0 0	1 1 0
WEST VIRGINIA NUMBER DAYS DEATHS INJURIES	0 0	0 0 0	0000	0 0 0	1 1 0	1 1 0 0	0000	0000	2 1 0 0	0000	0000	0000	4 3 0 0

	7	T	Γ			T	т —	7					
	· JAN	FEB	MAR	APR	MAY	NUL	JUL	AUG	SEP	ост	NOV	DEC	ANN
WISCONSIN NUMBER DAYS	0 0	0	0 0	0 0	0 0	4 2	00	0	5 2 0	0	0	0 0	9 4
DEATHS INJURIES	0	0	0	0	0	0	0	0	0	0	0	0	3
WYOMING NUMBER DAYS	0	0.	0	0	53	0	3 2	5 5	1 1	0	0	0	29
DEATHS INJURIES UNITED STATES	.0	0	0 .	0	0	0.	0	0	0	0	0	0	0
NUMBER DAYS & DEATHS INJURIES	1 1 7 0 3 7	57 10 1 74	88* 8 3 102	108 17 0	243 27 5 89	335* 28 11 324	106 26 0	60 22 29 358	45 15 0	35 9 2 83	18 5 0 46	35 7 2 23	1133* 181 53 1177

^{*} CORRECTED FOR BOUNDARY-CROSSING TORNADOES

[&]amp; TORNADO DAYS FOR COUNTRY AS A WHOLE.

TORNADOES, TORNADO DAYS, AND DEATHS BY STATE AND NATION, 1953-90

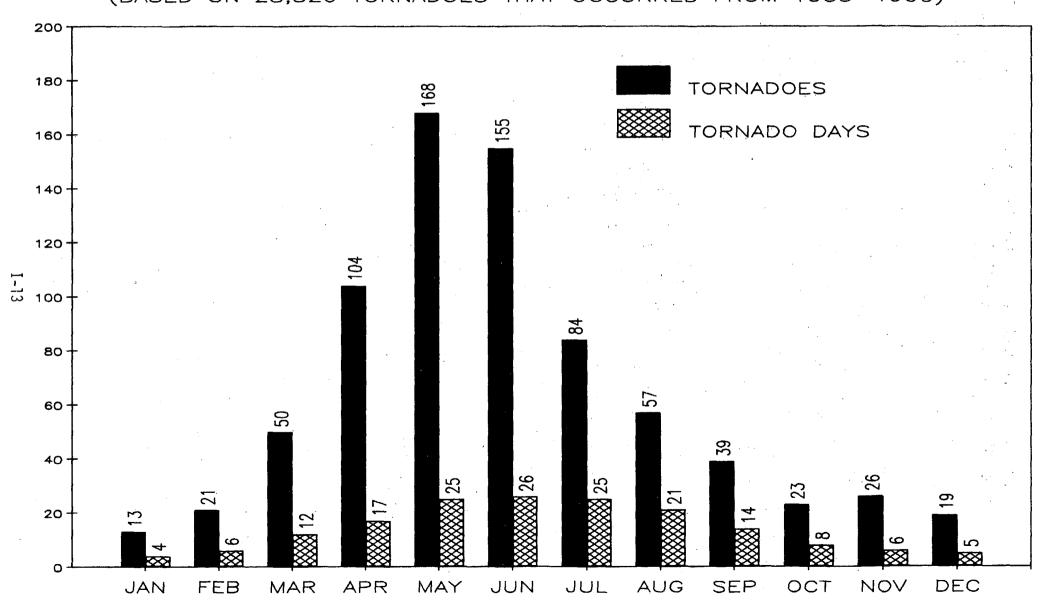
STATE			TORNADO	ES				[DAYS		DEATHS	
	TOTAL	AVERAGE	GREATEST	YEAR	LEAST	YEAR	PER # 10,000 SQ. MI.	TOTAL	AVERAGE	T:OTAL	AVERAGE	PER 10,00
ALABAMA ALASKA ARIZONA ARKANSAS CALIFORNIA	807 1 126 763 153	21 0 3 20 4	45 1 17 78 14	1983+ 1959 1972 1982 1983	5 0 0 2 0	1956 1989+ 1965 1987+ 1968+	4.07 .00 .27 3.77 .25	425 1 102 349 115	11 0 2 9 3	237 0 3 165 0	6 0 0 4 0	46 0 0 31
COLORADO CONNECTICUT DELAWARE DISTRICT OF COLUMBIA FLORIDA	826 50 36 0 1706	21 1 0 0 -	58 8 5 0	1982 1973 1975 0+ 1975	0 0 0 0	1959 - 1988+ 1987+ 0+ 1956	2.01 2.00 .00 .00 7.51	480 44 33 0 1090	12 1 0 0 28	2 4 2 0 70	0 0 0 0	0 8 10 0
GEORGIA HANAII IDAHO ILLINOIS INDIANA	761 27 86 1010 793	20 0 2 26 20	46 4 10 107 49	1974+ 1971 1986+ 1974 1990	2 0 0 4 4	1987 1987+ 1977+ 1953 1984	3.40 .00 .24 4.61 5.51	417 23 70 464 369	10 0 1 12 9	76 0 0 177 214	2 0 0 4 5	13 0 0 31 59
IOWA KANSAS KENTUCKY LOUISIANA MAINE	1176 1620 323 913 76	30 42 8 24 2	71 · 97 34 72	1990 1955 1974 1990 1971	7 14 0 3 0	1956 1976 1953 1955 1987+	5.33 5.10 1.98 4.95 .60	513 739 186 520 67	13 19 4 13	60 170 102 96 1	1 4 2 2 0	11 21 25 20 0
MARYLAND MASSACHUSETTS MICHIGAN MINNESOTA MISSISSIPPI	99 127 632 664 893	2 3 16 17 23	10 12 39 34 62	1975+ 1958 1974 1968 1988	0 0 2 5	1988+ 1988+ 1959 1988+ 1979	1.89 3.63 2.75 2.02 4.82	74 89 363 379 441	, 1 2 9 9	2 99 236 77 346	0 2 6 2 9	120 120 41 9 73
MISSOURI MONTANA NEBRASKA NEVADA NEW HAMPSHIRE	1027 168 1384 39 68	27 4 36 1	79 20 88 8	1973 1988 1990 1987 1963	5 0 10 0	1987+ 1974+ 1966 1985+ 1987+	3.88 .27 4.66 .09	450 118 651 35 59	11 3 17 0	133 1 51 0	3 0 1 0 0	19 0 7 0
NEW JERSEY NEW MEXICO NEW YORK NORTH CAROLINA NORTH DAKOTA	91 315 179 478 694	2 8 4 12 18	17 18 16 38 52	1989 1972 1990 1973 1976	0 0 0 2 2	1984+ 1953 1953 1970 1961	2.55 .66 .81 2.28 2.55	64 241 132 294 374	1 6 3 7 9	0 3 18 79 21	0 0 0 2 0	0 0 4 15 3
OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO	538 1969 33 344	14 51 0 9	43 107 4 33	1973 1957 1984 1985+ 1979	0 17 0 0	1988 1988 1988+ 1959 1989+	3.40 7.29 .00 1.99	280 810 29 221 8	7 2 1 0 5	171 201 0 73 0	4 5 0 1 0	41 29 0 16
RHODE ISLAND SOUTH CAROLINA SOUTH DAKOTA TENNESSEE TEXAS	7 347 936 420 4757	0 9 24 11 125	3 23 64 44 232	1986 1973 1965 1974 1967	0 1 1 1 32	1988+ 1986+ 1958 1987+ 1953	.00 2.90 3.11 2.60 4.68	6 228 444 229 1805	0 6 11 6 47	0 43 8 82 448	0 1 0 2	0 14 1 19
JTAH /ERMONT /IRGINIA /IRGIN ISLANDS /ASHINGTON	60 31 228 2 50	1 0 6 0	6 5 22 1 4	1984 1962 1975 1979+ 1989+	0 0 1 0	1989+ 1985+ 1982+ 1989+ 1988+	.12 .00 1. 4 7 .00	51 28 153 2 43	1 0 4 0	0 0 19 0 6	0 0 0 0	0 0 5 0
NEST VIRGINIA NISCONSIN LYOMING PACIFIC ISLANDS	76 723 378 2	2 19 9 0	6 43 42 1	1980+ 1980 1977 1981+	0 3 0 0	1988+ 1953 1970 1989+	.83 3.44 .92 .00	59 374 245 2	1 9 6 0	2 75 2 0	0 1 0 0	1 14 0 0

⁺ ÁLSO IN EARLIER YEAR(S). * CORRECTED FOR BOUNDARY-CROSSING TORNADOES. & TORNADO DAYS FOR COUNTRY AS A WHOLE.

[#] MEAN ANNUAL TORNADOES PER 10,000 SQUARE MILES. ' NUMBER OF DEATHS PER 10,000 SQUARE MILES.

AVERAGE NUMBER OF TORNADOES AND TORNADO DAYS EACH MONTH IN THE UNITED STATES

(BASED ON 28,820 TORNADOES THAT OCCURRED FROM 1953-1990)



NATIONAL TORNADOES, TORNADO DAYS, DEATHS AND RESULTING LOSSES BY YEARS, 1916-90

						PROPE	RTY LOSS FR	EQUENCY *
YEAR	NUMBER TORNADOES	TORNADO DAYS	TOTAL DEATHS	MOST DEATHS IN SINGLE TORNADO	TOTAL PROPERTY LOSSES \$	CATEGORY 5	CATEGORY 6	CATEGORY 7 AND OVER
1916 1917 1918 19120 1922 19223 19223 1925	90. 121 81 64 67 105 108 102 130 119	6855054975 3343556556	15516 55366 2992 1305 1176 3794	30 101 36 59 87 61 16 23 85 689	6 7 7 7 7 7 7 6 7	7 21 20 14 227 221 234	19520351 10351 112	0000000011
1992233333 1993333333 199333333 19933	111 163 203 197 192 151 258 180	57 629 774 727 567 97 77	144 5495 2779 2779 3964 77	23 92 140 416 37 346 11	6 7 7 7 7 6 7 7 6 6	28 420 488 384 23 460 29	0974611930	010000
1936 1937 1933 1933 1944 1944 1944 1945	151 1473 1524 1524 167 169 121	71 77 77 77 65 65 66 66 66	0931534850 5.289658571 3.22	6527855509 2 32126 06	7 6 7 7 7 6 7 7 7	17 249 2134 242 2501	506 321 1089 10	1000000001
19944 19944 19955 19955 19955 1995 1995	11111111111111111111111111111111111111	5880838602 193602 113602	78391049566 3139132 3239566 1532	15938867660 15938867660	7 7 7 7 7 7 7 8 7	96247533334 6547533334	7 7 11 13 9 11 19 18 18	0120020711
1957 1958 1959 1956 1966 1966 1966 1966	59564 60564 60560 60560 60556 60564 6064	154662921651158	8968618139 19654523739	25 44 19 12 16 15 24 44	7 8 7 7 7 7 7 7 8	83 129 70 653 151 773 1126	24 26 8 4 11 21 10 15 17 30	1 3 1 1 1 0 1 5 1 1
1966 1967 1968 1969 1971 1972 1973 1974 1975	5960838 66588 71047 11992	150 173 1755 1772 194 206 284 204	98 1141 1362 7526 1527 861 360	8342686749 5333325 3	©©©©©©©©©©©©©©©©©©©©©©©©©©©©©©©©©©©©©	79 1252 8987 7009 10166 189	133664 24087 24087 281	4869651951 21
1976 1977 1978 1979 1980 1981 1982 1983 1984 1985	8352 8528 8568 8563 10461 9317 684	169 1893 1766 1775 1875 1896 1968	44334844444 4458226326	5262550368 1111	&& \$	145 17569 160144 20144 2193 114	4103229329505	56613230514
1986 1987 1988 1989 1990	764 656 702 856 1133	168 151 156 160 181	15 59 350 5	3 30 5 21 29	98998	157 112 148 133 215	66 348 60 91	9 6 17 18 18
MEAN	758	169	94	-	-	127	39	8

NOTE: - THE ABOVE ESTIMATED LOSSES ARE BASED ON VALUES AT TIME OF OCCURRENCE.

MEAN WAS DERIVED FROM DATA FOR PERIOD 1953-1990

^{\$} STORM DAMAGES IN CATEGORIES:

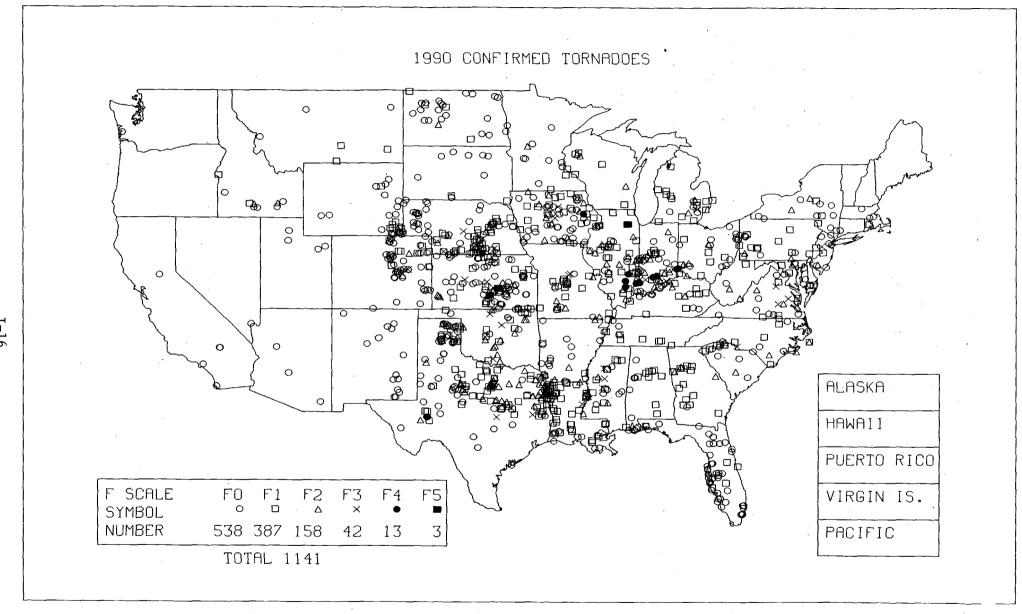
^{5: \$50,000} TO \$500,000 6: \$500,000 TO \$5 MILLION 7: \$5 MILLION TO \$50 MILLION

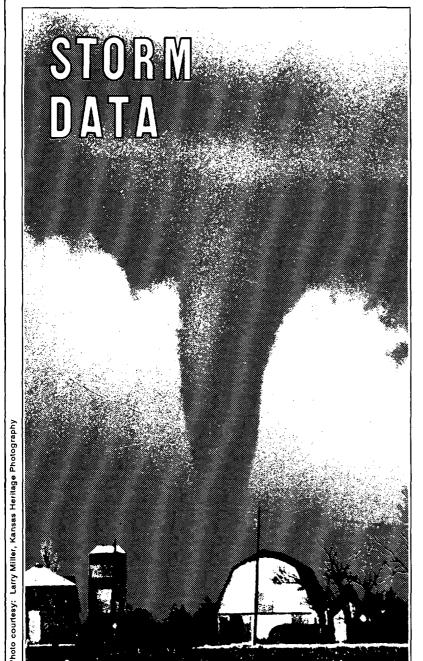
^{8. \$50} MILLION TO \$500 MILLION 9. \$500 MILLION AND OVER

^{*} NUMBER OF TIMES PROPERTY LOSSES REPORTED IN STORM DATA IN CATEGORIES 5,6,7, AND OVER.

NATION SUMMARY OF TORNADOES, TORNADO DAYS, AND DEATHS BY MONTH AND ANNUAL, 1953- 90

	J	JANUAR	Y	F	EBRUA	IRY	-	MARCI	 		APRIL	T		MAY			JUNE			JUL Y			AUGUS	1	SE	PTEMB	ER	0	CTOBE	R	N	OVE MB	ER	D	ECEMB	ER	, A	NNUAL	Τ
	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER .	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DEATHS	NUMBER	DAYS	DFATHS
YE AR.																						-																	
1953 1954 1955 1956 1957	14 2 3 2 17	6 1 2 2 3	0 0 0 0 13	16 17 4 47 5	3 9 3 12 3	3 2 0 8 0	40 63 43 31 38	10 13 15 -7 7	24 10 5	85	16 22 18 15 21	34 3 7 67 29	94 101 147 79 227	21 22 26 24 26	161 9 103 4 87	111 107 154 65 147	24 26 28 21 . 25	244 5 2 0 14	31 45 49 91 55	19 23 21 26 19	0 0 5 1 0	24 49 33 43 20	15 21 18 20	0 1 0 2 0	5 21 15 16 17	4 10 8 10	0 3 2 0 2	6 14 23 29 18	4 8 7 8	0 -2 1 0 2	12 2 20 7 58	6 2 4 6	0 0 1 0 25	21 17 3 9 38	8 3 2 4 4	49 1 0 0	421 550 593 504 856	136 160 152 155 154	1 3
1958 1959 1960 1961 1962	12 16 9 1 12	7 2 4 1 3	0 3 0 0	20 20 28 31 25	5 5 10 8 7	13 21 0 . 0	15 43 28 124 37	10 11 10 17 9	0 9 0 7 17	76 30 70 74 41	19 12 20 19 8	4 1 7 3 1	68 226 201 137 200	21 28 26 25 25	0 8 34 23 3	127 73 124 107 171	27 25 27 23 29	42 2 3 2 0	121 63 43 77 78	30 24 22 27 26	1 0 0 0	46 38. 47 27 51	20 18 23 16 21	1 0 1 0 6	24 58 22 53 24	14 15 13 16	1 14 0 15 0	9 24 18 14 11	10 10 5 10	4 0 1 0	45 11 25 36 5	6 6 7 4	0 0 0 - 1 0	1 2 1 16 2	1 2 1 5	0 0 0 0	564 604 616 697 657	166 156 172 169 152	6 5 4 5 2
1963 1964 1965 1966 1967	15 14 21 1 39	5 3 11 1 4	1 10 0 0 7	6 2 32 28 8	3 2 4 5 5	0 0 0 0	48 36 34 12 42	12 11 9 6 14	8 6 2 58 3	84 157 129 80 149	14 23 20 20 20 18	16 15 267 12 73	71 135 275 98 116	21 20 25 17 25	1 16 17 0 3	91 136 147 126 210	23 24 28 28 28	0 0 6 19 6	62 63 86 100 90	26 23 26 27 25	0 0 0 3 1	26 79 61 58 28	13 23 23 21 16	2 2 1 0 2	33 25 64 22 139	13 10 -21 13 16	3 0 0 0 5	13 22 16 29 36	5 4 4 6 7	0 22 1 6 4	15 17 -34 20 8	68635	0 0 5 0	0 18 7 11 61	0 5 4 3 10	0 0 0 10	464 704 906 585 926	141 156 181 150 173	9
1968 1969 1970 1971 1972	5 3 9 18 33	3 1 5 7 10	0 32 0 1 5	7 5 16 83 7	3 5 3 12 4	0 0 0 131 0	28 8 25 40 69	8 2 12 13 17	0 1 2 2 0	102 68 117 75 96	15 15 16 14 20	40 2 29 11 16	145 145 88 166 140	26 25 19 24 27	72. 4 26 7 0	136 137 134 199 114	27 28 24 28 25	11 7 6 1 2	56 99 81 100 115	22 27 26 30 29	2 0 3 1 0	66 69 55 50 59	23- 21 21 21 - 21 23	2 19 0 0 2	25 20 54 47 49	14 11 20 15 19	0 0 0 0	14 26 50 38 34	9 10 13 12 10	0 6 0	44 5 10 16 17	12 3 4 7 4	3 0 0 0 2	32 23 14 56 8	9 7 8 9 6	1 0 2 0	660 608 653 888 741	171 155 171 192 194	15
1973 1974 1975 1976 1977	33 24 52 12 5	7 8 7 5 4	1 2 12 0 0	10 23 45 37 17	4 9 12 6 -3	0 0 7 5 2	80 36 84 180 64	16 12 16 18 18	17 1 12 21 0	150 269 108 113 88	22 22 20 23 15	10 313 13 1 1 26	250 144 188 155 228	26 28 30 24 29	35 10 5 8 4	224 194 196 169 132	26 26 28 26 27	2 31 6 3 0	80 59 79 84 99	26 19 26 28 27	0 0 2 2 1	51 107 60 38 82	23 26 25 18 26	4 0 2 1 6	69 25 34 35 65	22 11 17 15 21	3 0 0 3 1	25 45 12 11 25	11 10 7 5	. 0 4 0 0	81 13 40 0 24	11 8 8 0 10	12 0 0 0 0	49 8 22 1 23	12 5 8 1 7	3 0 1 0	1102 947 920 835 852	206 184 204 169 189	4
1978 1979 1980 1981 1982	23 16 5 3 18	7 9 4 3 8	2 0 0 0	6 4 11 25 3	3 3 5 5 2	0 0 0 2 0	17 53 41 33 60	8 13 15 13 13	0 1 2 1 6	107 120 137 84 150	17 17 16 18 20	58 4 13 30	213 112 203 187 327	27 23 25 24 28	7 2 8 0 14	148 150 217 223 198	28 24 30 29 30	17 8 7 8 4	143 132 95 98 95	30 30 26 27 29	11 1 5 0	65 127 73 64 34	24 27 27 22 15	1 5 0 0	20 68 37 26 38	10 19 14 16 12	6 2 1 0 2	7 47 43 32 9	5 12 7 12 4	7 1 0 0	9 21 3 7 19	5 8 2 5 6	0 0 0 0 0	30 2 1 1 95	9 1 1 1 13	5 0 0 0 7	788 852 866 783 1046	173 186 176 175 182	l 8
983 1984 1985 1986 1987	13 1 2 0 6	2 1 2 0 3	0 0 0 0	41 27 7 30 19	7 4 4 11 4	1 0 0 2 6	71 73 38 75 38	21 15 12 9 11	0 64 . 2 6 1	65 176 134 84 20	15 22 19 17 8	6 33 5 2	249 169 182 173 126	26 27 28 25 25	14 6 78 1 31	178 242 82 134 132	27 25 24 25 29	2 14 3 0 2	99 72 51 88 163	27 21 19 24 28	4 0 0 3 0	76 47 108 67 63	21 20 26 23 24	0 0 3 1	20 17 40 65 19	15 12 16 17 10	0 0 0 0	12 49 18 26	5 12 8 7 1	04000	49 30 19 17 55	11 5 8 8 5	0 1 3 0 11	58 4 3 5 14	13 2 2 2 3	5 0 0 6	931 907 684 764 656	190 166 168 168 151	12
988 1989 1990	17 15 11	3 6 7	5 0 0	4 18 57	3 3 10	0 0 1	28 44 88	10 14 8	1 1 3	58 82 108	16 13 17	4 0 0	132 234 243	24 28 27	3 9 5	63 253 335	21 27 28	0 5 11	103 59 106	23 19 26	0 0 0	61 36 60	13 20 22	3 0 29	76 31 45	16 12 15	1 0 0	19 30 35	8 7 9	0 4 2	121 58 18	13 10 5	14 31 0	20 3 35	6 1 7	1 0 2	702 856 1133	156 160 181	30.0
POR IEAN	502 13	167 4	98 3	791 21	213 6	204	1907 50	454 12	295 8	3960 104	662 17	1160 31	6374 168	944 25	818 22	5886 155	998 26	495 13	3210 84	953 25	46 1	2148 57 ¹	793 21	97 3	1463 39	533 14	64	890 23	294 8	72 2	991 26	242 6	109	714 19	187 5	117	2 8 821 758	6440 169	357 9





STORM DATA is a monthly chronicle of significant and unusual weather events. Photographs and charts depicting storms, descriptions of extraordinary weather events occurring in each state, and summary tables of storm-related deaths, injuries, and property and crop damage are contained in this publication.

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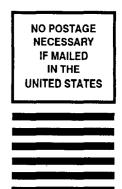
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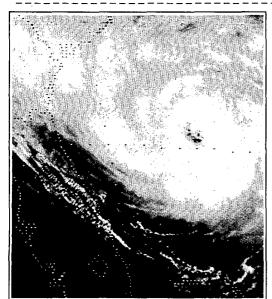
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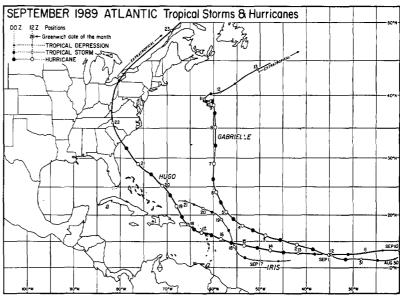


HURRICANE HUGO, SEPTEMBER 10-22, 1989

Despite excellent warning lead times and excellent government and public response to the warnings, the fury of Hurricane Hugo took many by surprise and will undoubtedly haunt the memory of many Americans for years to come. Along with numerous deaths and injuries, HUGO brought large-scale devastation to much of the Carolinas, Puerto Rico, the Virgin Islands and other islands of the Caribbean, making it the costliest hurricane in U.S. history.

Over the course of slightly less than two weeks, HUGO followed a trajectory that was typical for an Atlantic Basin tropical system: originating near Africa in the vicinity of the Cape Verde Islands, traveling west across the tropical Atlantic to the Leeward Islands, turning northwest toward the U.S. coast until making landfall in the Carolinas, and once inland, turning northeast under the influence of the Westerlies and becoming extratropical while skirting the eastern U.S.-Canada border (see map below). The system originated from a cluster of thunderstorms that moved off the African coast on September 9th and organized into a tropical depression on the 10th just southeast of the Cape Verde Islands. The system moved west at 18 knots, attaining storm status on the 11th, and hurricane status on the 13th while located about 1100 nautical miles east of the Leeward Islands. HUGO gradually turned west-northwest and slowed in its translation as it headed for the Islands. While still several hundred miles east of the Islands on the 15th, the first reconnaissance aircraft reported HUGO as having a minimum central pressure of 918 mb and an estimated maximum surface wind of 140 knots. This turned out to be HUGO's maximum intensity.

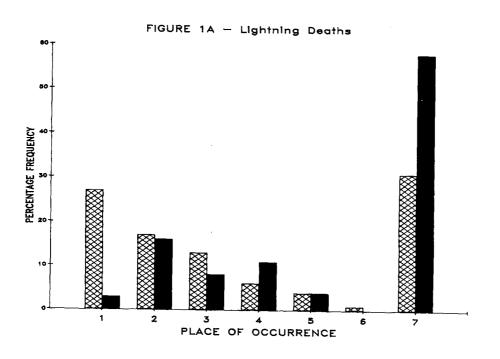


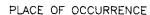


NATIONAL SUMMARY OF LIGHTNING, 1990

JAY HOLLIFIELD NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE NATIONAL CLIMATIC DATA CENTER

Seventy-four people were killed in the United States during 1990, which was 21 percent below the national average of 94 deaths. There were 252 injuries which was 2 percent below the national average of 258. Locations and percentage frequency of lightning deaths are depicted in the following two figures for 1990, and for the period 1959-1990:



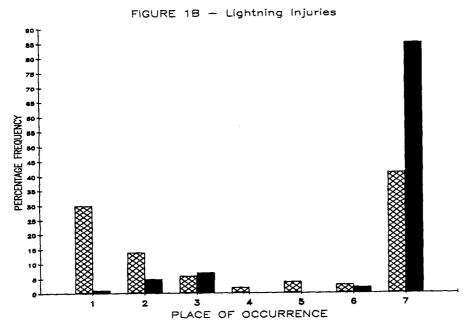


- 1. Open fields, Ball fields, etc.
- 2. Under trees

LEGEND

1959-1990

- 3. Boating, fishing and water related
- 4. Near tractors, heavy road equipment
- 5. Golf Courses
- 6. At telephones
- 7. Various other and unknown locations



JANUARY: Eleven people were struck by lightning in Crystal Lake, IL during a thunder snowstorm. A lightning bolt hit a light pole and traveled through the snow cover, injuring 11 people who were either shoveling snow or pushing stranded motorists in a company parking lot. A woman was injured by lightning in another parking lot in Palatine, IL during the same storm. A 13-year-old boy was struck by lightning while fishing from a pirogue, in Bayou Dularge, in Terrebonne Parish, LA. The charge entered through his head and exited at his waist. The boy was resuscitated and hospitalized, but died 10 days later from injuries. A home in Kent County, MI was struck by lightning which caused a \$200,000 fire. Two people were severely burned from a house fire that was started from lightning in Jefferson County, Lightning killed seven cows valued at \$14,000 in Murchison, TX.

FEBRUARY: Lightning struck a home in Corning, AR that damaged the foundation and broke a couple of windows. Lightning struck and killed eight cows and two bulls that were standing in a group in a pasture. The incident occurred in Trenton, TN. The estimated cost of the cattle was \$8,000.

MARCH: A construction worker on the roof of a loading dock was killed by lightning in Jacksonville, FL. Seven cows were killed by a single lightning strike in Bonifay, FL. One man was injured when lightning came through a telephone line and another was knocked off a stepladder outside the building when lightning struck in Hollandale, MS. Lightning struck an apartment complex in Durant, OK that caused \$250,000 in damage. One man was killed and another injured when lightning struck a road grader and traveled down a cable where they were loading I-beams onto a tractor-semitrailer near Linden, TX. A man was struck and killed by lightning while walking his dog in Greenfield, WI.

APRIL: A woman received minor injuries when struck by lightning while using a water pump. Five cows were killed by another strike in a field. Both incidents occurred in Rea Valley, AR. A Greensboro, North Carolina man was struck by lightning as he was getting out of his car. He was hospitalized, but was soon released. Twelve miles southwest of Guthrie, OK a 29-year-old man was struck and killed by lightning while walking back to his pickup truck. Lightning struck a clump of trees and killed 25 head of cattle that had gathered under the trees for cover in Medina County, TX.

MAY: A man in Plumeville, AR was struck and injured by lightning while trying to push a pickup truck out of mud. A 17-year-old girl was shocked and burned while

talking on the telephone, when lightning struck near the back of her house in Canton, IL. Lightning started a fire that burned a barn in Hardyville, KY killing 22 Holstein calves. Damage was estimated at \$32,000. Lightning struck and injured a 29-year-old male civilian employee at Barksdale Air Force Base, LA who was working on the flight line. A construction worker in Roxbury, MA was struck by lightning and fell 10 feet from a truck to the ground and was taken to the hospital. Lightning struck and injured a fireman who was directing traffic in Davidson County, NC. A police dispatcher was injured by lightning while talking on the telephone in Davidson County, NC. Lightning struck a tree in Bowman, SC killing 18 pregnant heifers that had sought shelter underneath it. The cattle were valued at \$30,000. A man was struck by lightning and killed near Jamestown in Fentress County, TN while working outside. A 10year-old boy was struck and killed by lightning while hoeing weeds in a field near his home in Bastrop County, TX. A 28-year-old woman was struck and killed by lightning, while trying to get her children out of the water on a beach, on the western end of Galveston Island, TX. Local beach patrol was in the process of warning swimmers to get out of the water when the fatality occurred.

JUNE: Lightning struck and killed a 41-year-old man and injured a 31-year-old woman who were standing under a tree in Hoover, AL. Lightning struck and killed a 26-year-old woman and injured a companion who were standing beside a car in Lockart, FL. A 22-year-old male lawn worker was killed and a second injured by a single lightning strike in Davie, FL. A 34-year-old man was killed by lightning while sitting under a tree in North Miami, FL. Lightning killed seven cows that were huddled near a wire fence in North Fairfield, IL. A 62year-old man was killed by lightning in rural Fort Scott, KS while he was on his riding lawn mower. Lightning struck a 31-year-old male student as he was walking across the campus of the University of New Orleans. The lightning entered through his head and exited through his left foot, ripping his shoe and sock off his foot. Paramedics revived the man, but he remained in a coma and died six days later. Three other students in the vicinity of the lightning strike were knocked to the ground, but only received minor injuries. A 65-year-old man in Collins, MS walked under a clothesline that was attached to pine trees when lightning struck the tree and ran through the wire and hit him. He was dead on arrival at the hospital. Lightning struck a 38-year-old man riding a tractor near Chapman, NE. He was pronounced dead from cardiac arrest about an hour later. A 63-year-old man holding a golf club was struck by lightning while on a golf course near Hendersonville,

NC. He died 2 weeks later. Two golfers, ages 67 and 31, were killed when the tree they were under was struck by lightning. They were father and son and the incident occurred at Hendersonville, NC. Two men in Chester County, PA were struck and killed by lightning. Lightning struck a tree and then the two men who were standing by an automobile parked nearby. Eight Boy Scouts were injured when lightning struck a shelter tent at Skymount Scout Camp in Grundy County, TN. Lightning struck and killed 15 cows in an open field in Gainesville, TX. A 37-year-old man in Nederland, TX was killed by lightning while directing dump trucks at a landfill site. A 62-year-old woman in Provo, UT was seriously injured when lightning struck the tree that she was using as shelter from the rain. The bolt traveled down the tree, into her body at the back of the neck then exited from her buttocks. She was revived by CPR.

JULY: An 18-year-old male was struck and injured by lightning while attending a concert at an amphitheatre 14 miles south of Birmingham, AL. While chatting with a friend near a mulberry tree, a 35-year-old woman was knocked to the ground. She had 1st and 2nd degree burns; coins in her pockets were partially melted, and rivets on her jeans were also melted. The incident occurred at San Manuel, AZ. A man was killed and his fiancee seriously injured when struck by lightning while camping near Molas Lake 5 miles southwest of Silverton, CO. A man was struck in the chest by lightning and killed while walking on the beach at North Shores, DE. A man walking with him was seriously injured by the same bolt of lightning and died the next day. Two roofers were injured by a lightning strike at Coral Springs, FL. One of the men died ten days later. Lightning struck a raft on the Chattahoochee River in extreme northern Atlanta, GA and injured six of the nine rafters on board. The uninjured persons were thrown from the raft upon impact. Lightning struck and killed a 14-year-old boy as he walked beside a pool in Atlanta, GA. A 39-year-old man suffered a heart attack and died after being struck by lightning at Westphalia, IN. The man along with two others had been swimming in a pit when they noticed a thunderstorm approaching. They left the water, but before reaching the safety of a car the lightning bolt directly struck the man. Lightning struck a tree north of Kokomo, IN killing one and injuring four people who were seated in metal lawn chairs under the tree. Lightning either struck a picnic area pavilion, or a charge entered through the open side of the pavilion, where a family was taking shelter during a thunderstorm at Cypermort Point State Park, LA. The electrical discharge fatally injured the 31-year-old father, and caused minor injuries to the mother and one son. Two other children were not injured. A golfer was injured and a 31-year-old man was killed when lightning struck a tree where they had gone for refuge from a storm in Cumberland County, ME. A 63-year-old man was killed instantly near Enid, MS when lightning struck a tree that the man had placed his foot on. A 39-year-old man was killed by lightning while standing under a tree in his front yard in Mowrystown, OH. Lightning killed a 38-year-old man while riding a tractor near Jewett, OH. Lightning struck and killed a 29-year-old man sitting at a picnic table at Strawberry Resevoir, UT. An 11-year-old boy was seriously injured by lightning while playing in his yard at Dinwiddie, VA; he died eight days later. Twenty-four people were injured by lightning near Masontown, WV. They were members of a bow-hunting club who were attending an archery shoot and sought shelter from the rain under a 10' x 20' open-end pavilion. The pavilion consisted of wooden supports and a tin roof in a wooded area. Lightning struck the pavilion, splintered a wooden support post, melted gold plating off archery trophies, and punched pin holes in soft drink cans. People were knocked to the ground or thrown 10 to 15 feet. Injuries were mostly burns.

AUGUST: A Lacey Springs, AL man was knocked unconscious by lightning while attending a clothes dryer when lightning struck the house. Lightning struck and killed a mother and daughter and injured another child as they fished in a pond near Palm Beach International Airport, FL. An elderly hiker was killed when lightning struck him as he hiked in the woods at Indiantown, FL. Lightning struck and killed a man while he and his wife were packing to leave a fishing pier at Oldsmar, FL. A 55-year-old man was killed by lightning while he was attaching siding to an outdoor building in Crossville, IL. The man was standing on a metal ladder. A 75-year-old Cadaz, KY woman was injured when lightning entered her residence through a smoke detector, knocking her out of a chair. A 36-year-old Orneville, ME man was killed when lightning struck him and a small tree. A lightning bolt killed a boy and seriously injured another, when they were caught in a fast-moving thunderstorm, along a narrow passage atop mile-high Mount Katahdin in Piscataquis County, ME. One boy was killed when a bolt of lightning struck him as he was crossing the "Knife's Edge" trail. The other 14-year-old boy suffered burns to his head, neck, and legs. Six people picnicking in Huron Metro Park, MI were injured and taken to the hospital when struck by lightning. Lightning struck and killed a 51-year-old man at Kaw Lake, OK. The man was standing ashore near a boat. A 35-year-old man was struck and killed by lightning while loading watermelons onto a pickup truck near Alex, OK. Lightning struck a group of campers at Lake Arcadia, OK; a 39-year-old man was killed and two others seriously injured. Two men were injured by lightning while standing under a tree in Wilson, PA. Lightning struck some construction equipment in Point Comfort, TX killing a 27-year-old man and injuring three others who were nearby. Lightning struck and killed a 55-year-old man riding an all-terrain vehicle on the Clayton Williams Ranch in southern Jeff Davis County, TX. Lightning struck two separate areas of Fort McCoy, WI injuring 13 army reservists.

SEPTEMBER: A 33-year-old man was struck and killed by lightning while playing golf near Apache Junction, AZ. The man had six or seven exit wounds from the lightning strike. Nine campers were struck and injured by lightning while taking shelter from an intense hail storm in San Bernardino County, CA. Two men were bow-hunting near Steamboat Springs, CO when lightning struck them. The older man (48) was killed instantly and his companion (34) suffered injuries to his legs. Lightning struck two men fishing in the surf at Satellite Beach, FL; one man was killed and one was injured. A 30-year-old man died instantly after being struck by lightning in Johnson County, IL. He had taken shelter on the porch of a building at the Refuge Ranch near Goreville. Lightning struck and killed a motorcycle driver and injured his passenger in Las Vegas, NV. Lightning killed a man instantly while he was fishing with friends in Rio Reservoir in Sullivan County, NY. The bolt of lightning struck him in the left side of the head and his body was thrown into the water. Another person in the boat was injured. The fishing vessel also received some damage. One person was killed and four injured by lighting after taking refuge under a wooden pier at Swan Quarter, NC. Lightning killed a woman and injured her daughter while in a field in Hubbard Township, OH. Lightning struck and injured two brothers in Walhalla, SC as they walked under a pine tree. The bolt also killed a coon hound.

OCTOBER: A man was struck and injured by a bolt of lightning in Killingly, CT. Three people were sleeping in their home in Holland, MI when lightning struck the roof, and ignited the insulation. The fire then spread to the garage. About 4:30 a.m. a passerby noticed the fire and awakened the people inside the home. By the time the fire fighters arrived and got the fire under control, around \$100,000 damage was done to the house and garage. No one was hurt during the fire, thanks to the passersby who cared enough to awaken the residents of the home.

NOVEMBER: Lightning strikes knocked out the power for about an hour in Bentonville, AR. Lightning struck a home in Gracemont, OK. The damage was estimated by the National Weather Service at \$50,000.

DECEMBER: Two houses burned down after being struck by lightning in Pope County, AR. Two women walking on a levee along a pond eight miles northeast of Fouke, AR were struck by lightning. One woman was killed and the other was seriously injured. A house near Newton, GA was struck by lightning and burned to the ground.

Additional information is presented in the following tables.

More detailed information concerning lightning data can be obtained in the monthly STORM DATA publications. The National Climatic Data Center has lightning data available on magnetic tape for the period 1959-1990. The tape contains the date/time (year, month, day, and hour), location (state and county), number of fatalities, number of injuries, and amount of damage. A copy of this tape can be obtained by contacting the National Climatic Data, Federal Building, Asheville, North Carolina 28801-2696 (telephone: (704) 259-0682).

TOTAL DEATHS BY STATE AND NATION FOR YEAR 1990

STATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	001	NOV	DEC	ANN
ALABAMA ALASKA ARIZONA ARKANSAS CALIFORNIA	0 0 0	0 0 0 0	00000	00000	00000	1 0 0 0	0 0 0 1	1 0 0	0 0 1 0	0000	00000	00010	2 0 1 1
COLORADO CONNECTICUT DENEMARE DISTRICT OF COLUMBIA FLORIDA	0 0 0	0000	00001	0 0 0 0	0 0 0	9000	1 0 3 0 2	00005	1 0 0 1	0 0 0 0	00000	0000	2 0 3 0 15
GEORGIA HAWAII IDAHO ILLINOIS INDIANA	0 0 0	0000	00000	0 0 0 0	0 0 0 0	0000	2 0 0 0	0 0 0 1	0 0 1 0	0 0 0 0	0 0 0	0 0 0	2 0 0 2 2
IOWA KANSAS KENTUCKY LOUISIANA MAINE	0 0 0 1 0	00000	00000	0 0 0	00000	0 1 0 1 0	0 0 1 1	0 0 0	00000	00000	0 0 0 0	0000	0 1 0 3 3
MARYLAND MASSACHUSETTS MICHIGAN MINNESOTA MISSISSIPPI	0000	0000	00000	0 0 0 0	0 0 0 0	0 0 0 1	0 0 0 0 1	0000	00000	0 0 0	00000	00000	0 0 0 0 2
MISSOURI MONTANA NEBRASKA NEVADA NEW HAMPSHIRE	0 0 0	0000	0000	0000	0 0 0	0 0 1 0	1 0 0 0	00000	0 0 1 0	0000	0 0 0	0 0 0 0	1 0 1 1 0
NEW JERSEY NEW MEXICO NEW YORK NORTH CAROLINA NORTH DAKOTA	0 0 0 0	00000	0000	0000	0000	0 0 1 3 0	0000	0 0 0 1 0	0 0 1 1 0	00000	00000	0000	0 0 4 5 0
OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO	0 0 0	00000	0 0 0	0 1 0 0	0000	0000	3000	0 3 0	0 0 0	00000	0 0 0 0	0 0 0	5 4 0 2 0
RHODE ISLAND SOUTH CAROLINA SOUTH DAKOTA TENNESSEE TEXAS	0 0 0	0000	0 0 0 0	00000	0 0 0 1 2	0 0 0 1	0000	0000	0 0 0 0 1	0000	0000	0 0 0 0	0 0 0 1 7
UTAH VERMONT VIRGINIA MASHINGTON MEST VIRGINIA	0 0 0 0	0 0 0 0	00000		0000	0000	1 0 1 0	00000	00000	00000	00000	00000	1 0 1 0
AISCONSIN AYOMING	0	0	1 0	0 0	0	0	0	0	0	0	0	0	1 0
TOTAL: UNITED STATES	1	0	3	1	3	18	22	15	10	О	0	1	74

TOTAL INJURIES BY STATE AND NATION FOR YEAR 1990

STATE	JAN	FEB	MAR	APR	MAY	NUL	JUL	AUG	SEP	ОСТ	NOV	DEC	ANN
ALABAMA ALASKA ARIZONA ARKANSAS CALIFORNIA	0 0 0 0	00000	00000	000000	0 0 1 0	1 0 0	2 0 1 0	4 0 0 1	0 0 1 0 9	0000	0 0 0	0 0 0 1	7 0 2 5 9
COLORADO CONNECTICUT DELAHARE DISTRICT OF COLUMBIA FLORIDA	0 0 0 0	00000	0 0 0 0	0 0 0 0	00000	0 1 0 0 6	8 0 0 0 15	4 0 0 6	1 0 0 0	0 1 0 0	0 0 0	00000	13 2 0 0 29
GEORGIA HAWAII IDAHO ILLINOIS INDIANA	0 0 0 12	00000	0000	0 0 0	0 0 1 0	0 0 1 0	7 0 0 1 6	2 0 1 0 1	0000	0 0 0	0 0 0 0	0 0 0 0	9 0 1 15 7
IOWA KANSAS KENTUCKY LOUISIANA MAINE	0 0 0	00000	0 0 0 0	00000	0 0 0 1 0	1 3 0 4 0	0 1 0 2 3	0 0 1 0 2	0 0 0	0 0 0	00000	0 0 0 0	1 4 1 7 5
MARYLAND MASSACHUSETTS MICHIGAN MINNESOTA MISSISSIPPI	0 0 0	00000	0 0 0	0 0 0	1 1 0 0	3 0 0 1 0	0 0 0 2	0 0 6 1 0	0 0 0	0 0 0 0	00000	0000	4 1 6 4 3
MISSOURI MONTANA NEBRASKA NEVADA NEW HAMPSHIRE	0 0 0	00000	0000	0 0 0 0	00000	0 0 1 1 0	0 4 0	0000	0 0 0 1 0	0 0 0	00000	0 0 0 0	0 0 5 2 1
NEW JERSEY NEW MEXICO NEW YORK NORTH CAROLINA NORTH DAKOTA	0 0 0	00000	00000	0 0 0 1	00000	0 4 0 3	0 0 1 0 0	0 0 3 5 0	0 0 1 4 0	0 0 0	00000	0 0 0	0 0 9 12 3
OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO	00000	0000	00000	0000	1 0 0 0	0000	00000	0 0 0 0 0	1 0 0 4 0	0 0 0	0000	0000	4 4 0 9 0
RHODE ISLAND SOUTH CAROLINA SOUTH DAKOTA TENNESSEE TEXAS	0 0 0	0000	0 0 0 0	0000	0000	0 0 8 1	0 2 0 0	0 1 0 0 4	0 2 0 0	00000	00000	0 0 0	05089
UTAH VERMONT VIRGINIA HASHINGTON HEST VIRGINIA	0 0 0 0	00000	00000	00000	0000	1 0 0 0	0 0 4 0 24	0 0 0	0 0 0	0000	00000	0 0 0 0	1 0 7 0 25
WISCONSIN WYOMING	0	0	0	0	0	0	0	1 3 0	0	0	0 0	0	13 0
TOTAL: UNITED STATES	12	٥	4	6	10	43	88	62	25	1	0	1	252

TOTAL DEATHS BY STATE AND NATION FOR PERIOD 1959-90

STATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC	ANN
ALABAMA ALASKA ARIZONA ARKANSAS CALIFORNIA	0000	0 0 0	20080	2000	5 0 2 13	23 0 1 31 2	26 19 28 8	19 0 15 20 5	1 0 12 4 3	1 0 1 0	0 0 0 0	0 0 1 0	79 0 50 105 18
COLORADO CONNECTICUT DELAWARE DISTRICT OF COLUMBIA FLORIDA	0 0 0 0	0 0 0	0 0 0 0 5	2 0 0 0 4	1 0 2 0 2 4	19 4 2 2 76	37 5 7 1 82	16 3 3 1 78	1 1 0 0 38	1 0 0 0 4	0 0 0 0	0 0 0 0	86 13 14 4 313
GEORGIA HAWAII IDAHO ILLINOIS INDIANA	0 0 0 0	0 0 0 0	2 0 0 0 1	4 0 1 4 2	6 0 1 9 7	18 0 6 23 21	32 0 5 12 17	10 5 14 12	2 0 1 1 1 5	1 0 0 2 2	0 0 0	0 0 0 0	75 0 19 75 67
IOWA KANSAS KENTUCKY LOUISIANA MAINE	0 0 1 1 0	0 0 0	1 0 0 1 0	3 4 3 5 0	11 10 9 10	19 7 21 21 3	6 14 17 41 6	13 12 14 16	4 4 10 11	4 2 0 0 3	0 2 0 4# 0	0 0 0 1 0	61 55 75 111 20
MARYLAND MASSACHUSETTS MICHIGAN MINNESOTA MISSISSIPPI	0 0 0 0	0 0 0 0	0 0 0 0 4	0 1 1 3 2	4 3 7 3 12	5 4 22 10 12	8 6 28 11 27	11 9 23 13 21	1 1 7 10 6	1 0 0 1 0	0 0 0 0	81* 0 0 0	1 1 1 2 4 8 8 5 1 8 5
MISSOURI MONTANA NEBRASKA NEVADA NEW HAMPSHIRE	0 0 0	0 0 0	5 0 0 0	4 0 1 0	20 20 30 0	19 8 15 2	1 4 6 8 0 3	00000	3 1 4 1 0	1 0 0 0	0 0 0 0	0 0 0	74 19 37 5 6
NEH JERSEY NEH MEXICO NEH YORK NORTH CAROLINA NORTH DAKOTA	0 0 0	0 0 0 1 0	0 0 0 5 0	1 1 0 3	3 5 9 23 0	8 11 20 36 4	22 23 61 51	14 29 26 35	6 5 6 5 0	0 0 2 0 0	0 0 0	0 0 0 0	54 74 124 159
OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO	0 1 0 0	0 1 0 1 0	0 1 0 0	3 10 0 1	10 14 2 8	22 13 0 26 3	43 7 0 29 8	17 20 1 25	10 13 2 8 5	2 3 1 1 3	2 2 0 0	0000	109 85 6 99 28
RHODE ISLAND SOUTH CAROLINA SOUTH DAKOTA TENNESSEE TEXAS	0 0 0	0 0 0 1	0 1 0 1 1	0 0 7 14	0 6 4 15 29	1 11 1 31 18	1 31 6 24 39	0 13 1 19 23	2 7 3 14 16	0 0 3 2 7	0 0 0 3 1	0 0 0 0	4 69 18 117 148
UTAH VERMONT VIRGINIA WASHINGTON WEST VIRGINIA	0 0 0	0 0 0	0 0 0 0	3 0 0 0	1 0 10 0 4	5 4 9 1 2	8 5 11 0	6 4 10 0 3	2 0 3 0 1	1 0 0 0	0 0 0 0	0 0 0	26 13 43 1
WISCONSIN Wyoming	0	0	1 0	1 0	2	8 4	1 2 7	15 6	2	1 0	1 0	1 0	44 21
TOTAL: UNITED STATES	4	4	39	90	320	637	874	638	254	50	16	85	3011

^{*} ON DECEMBER 8, 1963 THE CRASH OF A JETLINER KILLING 81 PEOPLE NEAR ELKTON, MARYLAND, WAS ATTRIBUTED TO LIGHTNING BY THE CIVIL AERONAUTICS BOARD INVESTIGATORS.

[#] INCLUDES A LATE REPORT FROM 1988 THAT WAS NOT SHOWN IN PRIOR SUMMARIES.

TOTAL INJURIES BY STATE AND NATION FOR PERIOD 1959-90

STATE	JAN	FEB	MAR	APR	MAY	JUN	JŲL	AUG	SEP	ост	NOV	DEC	ANN
ALABAMA ALASKA ARIZONA ARKANSAS CALIFORNIA	6 0 2 1	1 0 0 2	10 0 0 2 0	3 0 0 13 13	8 0 6 31 0	24 0 1 37 2	59 0 29 37 15	48 0 24 60 7	2 0 18 10	4 0 3 1 1	0 0 0 0 1	0 0 0 2 1	165 0 83 196 51
COLORADO CONNECTICUT DELAWARE DISTRICT OF COLUMBIA FLORIDA	0 0 0	0 0 0 0	0 2 0 0 17	1 0 0 0 16	28 7 8 0 30	65 20 12 4 190	75 17 3 1 221	53 11 1 1	10 6 2 0 147	0 3 0 0 28	0 0 1 0	0 0 0 0	232 66 26 7 842
GEORGIA HAWAII IDAHO ILLINOIS INDIANA	0 0 0 12	0 0 0 0	5 0 0 2	7 0 1 2 4	22 0 6 17 21	65 0 17 43 32	124 0 15 63 35	35 1 19 48 25	3 0 4 28 1	5 0 1 2 0	00000	0000	266 1 63 215 120
IOWA KANSAS KENTUCKY LOUISIANA MAINE	0 0 0 1 0	00000	2 5 0 6	9 11 2 2 0	22 18 20 14 4	45 26 60 17 5	40 45 59 99 28	18 31 36 39 53	16 29 10 14	3 5 1 2 0	1 1 0 2 1	0 0 0 1 0	156 171 188 197 91
MARYLAND MASSACHUSETTS MICHIGAN MINNESOTA MISSISSIPPI	0 0 0 0	0 0 0	0 1 2 0 8	0 11 9 0 3	36 21 39 15 13	20 44 141 18 13	35 108 127 24 107	20 75 205 20 40	6 26 47 9 10	2 4 6 4 2	0 20 0	0 1 0 0	119 293 576 90 203
MISSOURI MONTÁNA NEBRASKA NEVADA NEW HAMPSHIRE	0000	1 0 0 0	3 0 0 0	8 0 4 0 0	20 5 14 0 2	16 9 8 2 20	10 13 11 31	15 11 16 3 5	3 2 6 1 2	2 0 0 0	4 0 0 0	0000	76 37 61 7 60
NEW JERSEY NEW MEXICO NEW YORK NORTH CAROLINA NORTH DAKOTA	0000	00000	0 0 0 29 0	0 1 1 15 0	5 19 17 42 2	11 15 67 74 3	53 57 146 116	19 51 130 116	16 6 25 29 4	0 0 4 2	0 0 1 1 0	0 0 0	104 149 391 426 16
OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO	0 1 0 0	0 1 0 6	32 3 0 0	3 16 1 0	56 32 2 22 0	54 38 2 113	62 33 0 120 3	106 39 9 136	50 23 5 45 2	4 19 0 2	12 5 0 0	0 0 0	379 212 19 444 6
RHODE ISLAND SOUTH CAROLINA SOUTH DAKOTA TENNESSEE TEXAS	0 0 0 1	20012	0 0 4 7	0 3 1 6 39	1 21 4 31 45	13 22 18 60 48	12 100 15 109 37	12 35 9 52 46	3 22 1 20 30	0 1 2 4 10	1 0 0 2	0 0 0 0	44 205 50 287 267
UTAH VERMONT VIRGINIA WASHINGTON HEST VIRGINIA	0 0 0 0	00000	0 0 1 0	1 0 2 0 1	4 0 8 5 0	19 3 17 1	17 11 90 7 47	14 2 33 8 26	4 0 7 0 1	2 0 0 1 1	00000	0 0 0 1 0	61 16 158 23 80
WISCONSIN WYOMING	0	1 0	2	4 0	1 8 4	26 32	59 18	43 21	7 6	2	2	0	164 81
TOTAL: UNITED STATES	26	23	143	213	7 6 5	1596	2539	2022	728	134	41	10	8240

NATIONAL TOTAL DEATHS BY YEAR FOR PERIOD 1959-90

YEAR	JAN	FEB	MAR	APR	MAY.	JUN	JUL	AUG	SEP	ост	NOV	DEC	ANN
1959 1960 1961 1962 1963	1 0 0 0	0 0 0 0	1 1 1 3 4	4 5 2 6. 3	18 7 9 27	25 33 23 20 37	50 25 47 26 42	39 17 20 28 20	13 9 10 9	7 0 1 1 2	00000	0 0 0 0 81*	158 97 113 120 210
1964 1965 1966 1967 1968	0 0 0 1 0	0 0 0 0	9 2 1 1 0	1 2 1	15 12 8 3 5	21 34 15 26 24	29 39 21 21 30	19 · 28 16 14 29	7 4. 11 1 9	. 1 2 3 2 3	1 0 0 1 1	0 0 0 1 1	108 125 76 73 103
1969 1970 1971 1972 1973	0000	0 0 0 0	1 0 2 1 2	5 1 1 1 3	13 17 12 -5	17 25 27 21 24	27 27 33 31 31	13 19 19 28 18	14 21 19 3	3 1 . 0 1 2	0 0 0 0	0 0 0 0	93 111 113 91 105
1974 1975 1976 1977 1978	0 0 0 0 0	2 1 0 0	0 3 0 0 1	7 3 . 1 . 4 1	12 11 9 9	21 19 19 19 19	28 28 19 16 24	24 18 19 35 22	. 6 6 3 14 3	0 2 2 1 1	0 0 0	0 0 0 0	102 91 72 98 88
1979 1980 1981 1982 1983	0 0 0 1	0 0 0	0 0 0 0	3 0 4 3 2	1 1 7 5 5	16 13 13 14 8	20 27 19 29 28	16 20 19 18 23	4 5 5 4 8	3 1 0 3	2 0 2 0 2	0 0 0 0	63 76 67 77 77
1984 1985 1986 1987 1988	0 0 0 0	0 0 0 0	1 0 0 0	3 5 2 2 3	10 12 9 14 9	14 12 13 18 17	20 26 21 28 21	10 8 17 15	7 8 5 7 2	1 1 1 2 1	1 1 0 0 2#	0 0 0 0	67 73 68 86 69
1989 1990	0	0	1 3	1	9 3	14 18	19 22	18 15	10	1 0	0	0	67 74
TOTAL	4	4	39	90	350	637	874	638	254	50	16	85	3011
MEAN	0	0	1	3	10	20	. 27	20	8	2	1	3	94

* ON DECEMBER 8, 1963 THE CRASH OF A JETLINER KILLING B1 PEOPLE NEAR ELKTON, MARYLAND, WAS ATTRIBUTED TO LIGHTNING BY THE CIVIL AERONAUTICS BOARD INVESTIGATORS.

NATIONAL TOTAL INJURIES BY YEAR FOR PERIOD 1959-90

YEAR		NAL	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ост	NOV	DEC	ANN
1959 1960 1961 1962 1963		0 0 0 0 7	00000	0 27 3 0	5 11 14 5 6	27 12 15 39 14	52 70 49 38 64	110 28 83 90 55	103 50 50 49 44	23 16 31 12 18	3 9 5 6	1 4 1 0	1 0 1 0	325 202 256 242 209
1964 1965 1966 1967 1968		0 3 0 0	0 2 2 0 0	10 2 1 0 4	15 4 2 4 2	14 26 37 7 16	38 42 39 35 52	99 59 42 59 117	53 59 44 33 155	8 19 15 4 14	1 1 2 9	0 0 0 1	0 0 0 1 0	239 217 183 145 370
1969 1970 1971 1972 1973		0 0 0 0	0 0 1 0	0 1 0 8 10	4 5 1 6 2	19 40 24 12 20	75 40 71 24 23	39 82 79 72 74	23 43 54 54 59	12 43 22 24 29	0 . 4 1 2 9	0 1 1 1 2	1 0 0 0	173 259 254 203 228
1974 1975 1976 1977 1978		0 0 0 0	9 3 1 0	1 0 0 0 5	3 1 7 3 3	12 30 16 35 19	27 60 39 58 100	56 107 73 58 73	51 154 68 67 54	1.2 42 13 62 42	1 1 1 4 5	0 0 0 4	0 1 1 0	173 399 219 291 301
1979 1980 1981 1982 1983		0 0 1 1 0	2 1 0 0	4 2 2 2 24	26 11 9 6 3	32 11 34 38 25	73 49 60 20 24	55 50 108 54 87	134 52 32 113	9 16 9 11 30	2 1 3 4 31	2 0 13 4 0	0 0 2 0	254 275 291 174 337
1984 1985 1986 1987 1988	•	0 0 0	0 0 2 0 0	7 29 4 2	5 4 2 8 14	13 42 15 66 22	43 48 58 49 53	80 61 112 121 133	53 33 43 70 63	44 27 22 43 19	7 4 3 3 5	1 0 0 1 1	0 0 0 1 0	253 248 271 364 311
1989 1990		1 12	0	8 4	16 6	23 10	70 43	135 88	51 62	12 25	4	2 0	0	322 252
TOTAL		26	23	143	213	765	1596	2539	2022	728	134	41	10	8240
MEAN		1	1	4	7	24	50	79	63	23	4	,	,	258

[#] INCLUDES A LATE REPORT FROM 1988 THAT WAS NOT SHOWN IN PRIOR SUMMARIES

LIGHTNING DEATHS BY STATE, RANK, AND LOCATION OF OCCURRENCE

1959-1990

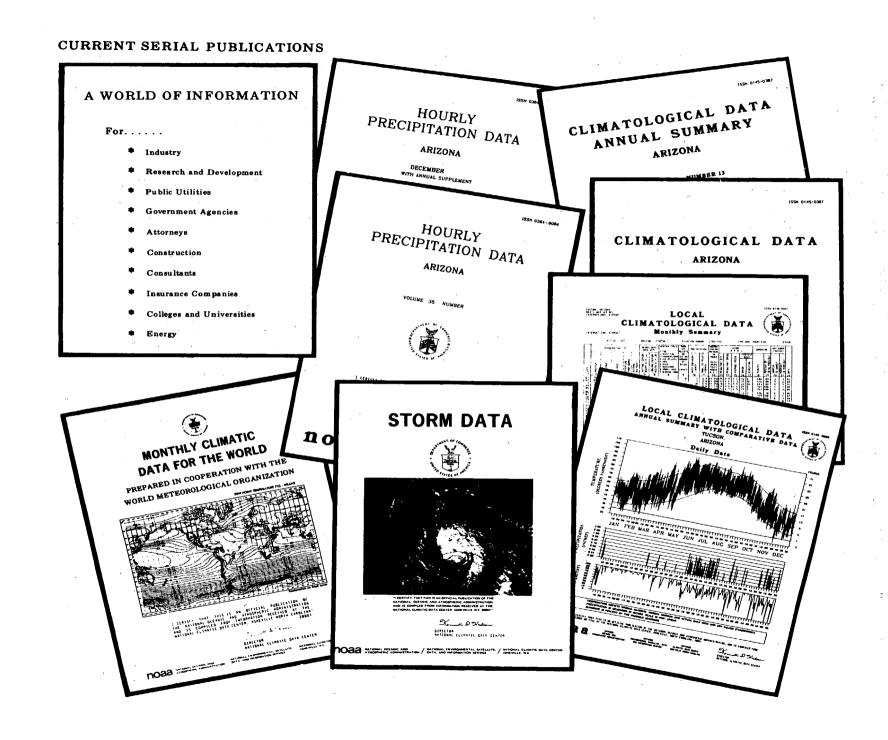
1990

	RANK	OPEN FIFEDS	BALL PARKS, AND OPEN SPACES	TIGE GIGHT	UNDER INCES	OATING, FISHING	AND WATER. RELATED	NEAR TRACTORS	HEAVY ROAD EQUIPMENT		COURSES	S JOHO J I JI I W		VARIOUS OTHER	AND UNKNOWN LOCATIONS	OPEN FIELDS,	OPEN SPACES	HANCO TOCCC	משמבע וענדי	BOATING, FISHING	RELATEO	NEAR TRACTORS	EQUIPMENT	900	COURSES	Survivos est	AI IELEFHUMES	VARIOUS OTHER	LOCATIONS
	-		_								T						1		Τ	·	_		Τ		1				
STATE ALABAMA ALASKA ARIZONA ARKANSAS CALIFORNIA	15 52 27 9 38	NO. 19 21 34 5	42 32	ND. 18 6 19 3	18	NO. 8 5 11 2	10 10 10 10	NO. 4	5 8 6	NO. 1 4 3	1 8 3	NO. 2	3 6	11 30 7	34 22 29 39	NO.	7	NO.	50	NO.	*	NO.	*	NO. 1	100	NO.	7		50 100 100
COLORADO CONNECTICUT DELAMARE DISTRICT OF COLUMBIA FLORIDA	12 42 41 48	42 3 4 1 85	49 23 29	18 2 2		4 4 75	5 29 24	3 1 21	.3 7 7	5 3 1 9	-6 23 25 3			14 5 5 82	16 38 36 26		7	. 2	13	1	7	1	,	1	7			2 3 9	100
GEORGIA HAWAII IDAHO ILLINOIS INDIAWA	16 51 36 18 22	20 11 16 9	27 58 21	19 3 12 20	25	11 2 3 6	.15	1 2 7 6	1 11 9	5 1 7	7 5 9	2	1 3	17 29 23	23 39 34			1	50		50								100
IONA KANSAS KENTUCKY LOUISIANA MAINE	23 24 17 7 35	8 15 21 15	28	8 1 10 31 3	13 2 13 28 15	1 4 4 35 6	2 7 -5 32 30	5 10 3 8	8 18 4 7	2 2 1	3 4 1	1	1	37 23 35 22 11	61 42 47 20 55	}		1	33	1	33		İ					1 2 2	100 67 67
MARYLAND * MASSACHUSETTS MICHIGAN MINNESOTA MISSISSIPPI	6 33 11 26 13	9 4 24 16 29	8 17 27 31 34	5. 3 23 12 20	5 13 26 24 24	13 1 10 5	12 4 11 10 11	6 5	2 12 6	1 10 1	4 11 2	1 2 2	4 2 4	84 14 17 9 22	76 58 19 18 26			1	50	•								1	50
MISSOURI MONTANA NEBRASKA NEVADA NEM HAMPSHIRE	19 37 30 47 45	16 . ; 7 16	Ι.	17 2 2	23 11 5	10 2 3 1	14 11 8 20 17	5 10	7 21 27	. 3	17	2	3	21 4 6 4 2	28 21 16 80 33				100			} 1	100					1	100
NEW JERSEY NEW MEXICO NEW YORK NORTH CAROLINA NORTH DAKOTA	25 20 4 2 44	18 35 20 34 2		5 13 31 22	9 18 25 14	13 6 17 21	24 8 14 13	2 4 6 3	4 3 4 27	4 1 5 6	7 1 4 4	2	1 1	10 19 46 69	19 26 37 43 55			2	40	1	25 20			1	20			3	75 20
OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO	8 14 46 10 31	33 30 30 30	30 35 50 30 39	20 11 13 8	18 13 13 29	15 15 3	14 18 3 4	6 6	3	7 1 11	11	1 2 1	1 2	27 20 3 38 8	25 24 50 38 29			2	20 100	.1	25	2	40 25	! !				5	40 50
RHODE ISLAND SOUTH CAROLINA SOUTH DAKOTA TENNESSEE TEXAS	49 21 40 5 3	5 32	22 28 27 .43	14 .1 31 24	20 6 26 16	1 6 2 8 20	25 9 11 7 14	7 8 9	10 44 8 5	1 1 7 4	1 6 6 3	3	4	3 23 1 28 29	75 33 6 24 20	. 1	14					3	43					1 3	100
UTAH YERMONT YIRGINIA WASHINGTON MEST YIRGINIA	32 43 29 50 39	11 1 8 1 6	19 100	6 1 9	23 8 21 :	2 4 5		3	7	2	5	1.	4	5 7 16	19 54 37 39														100
HISCONSIN HYONING	28 34	7	16 52	3	7 10	, 3 , 3	20 14	. 4	.9 .5	6	14			15	34 19													1	100
UNITED STATES		828	27	516	17	389	13	182	6	119	4	32	1	945	31	2	3	12	16	6	8	8	11	3	4			43	58

* ON DECEMBER 8, 1963 THE CRASH OF A JETLINER KILLING 81 PEOPLE NEAR ELTON, MARYLAND, WAS ATTRIBUTED TO LIGHTNING BY THE CIVIL AERONAUTICS BOARD INVESTIGATORS.

LIGHTNING INJURIES BY STATE, RANK, AND LOCATION OF OCCURRENCE

1959-1990																			19	90									
	RANK	OPEN FIELDS.	BALL PARKS, AND OPEN SPACES	STATE OF THE PROPERTY OF THE P	סמובש ועברים	, BOATING, FISHING	AND WATER RELATED	NEAR TRACTORS	HEAVY ROAD EQUIPMENT	1 1 2	COURSES	S AU HO E I LE		VARIOUS OTHER	AND UNKNOWN LOCATIONS	OPEN FIELDS,	OPEN SPACES	INDED TOPES		BOATING, FISHING	RELATED	NEAR IRACTORS	EQUIPMENT	J109	COURSES	STRUCTURE VALUE		VARIOUS OTHER	LOCATIONS
STATE ALABAHA ALASKA ARIZONA	20 52 30	NO. 53	32 59	NO. 23	14	NO. 3	2	NO.	1 6	NO.	1 1	NO. 10	x 6	NO. 74	2 45 24	NO. 1	% 14 50	NO.	2 14 50	NO.	z	NO.	Z	NO.	z	NO.	x	NO.	
ARKANSAS CALIFORNIA COLORADO CONNECTICUT OCLAWARE DISTRICT OF COLUMBIA	17 39 11 34 43 49	92 6 8	21 20 40 9 31 14	25 10 18 22 10 3	13 20 8 33 38 43	12 5. 15 4	6 10 6 6	6	3	16 3	7 5	3 3 2	6 1 5 8	95 26 82 28 6	48 51 35 42 23 14													9 13	100 100 100 100
FLORIDA GEORGIA HANAII IOAHO ILLINOIS	10 51 35 12	276 95 1 9 72	36 100 14 33	83 33 7 55	10 12 11 26	117 20 2	14 8 3	23 3 2 5	3 1 3 2	21 2 16	8 3 7	21 4 4 8	2 2 6	90 37 58	35 34 59 27			*,		6	7 67-			٠,		1	1	27 3 1 13	33 100 87
INDIANA IONA KANSAS KENTUCKY LOUISIANA HAINE	25 23 19 18, 16 28	27 26 55 93 3		20 14 23 31 33	25 13 8 12 16 36	12 1 2 7 18 3	10 1 4 9 3	1 7 3 4	3 1 4 2 2	2 10 11	1 6 6	2 7 7 2 2	1 4 4 1 2	103 105 82 49	44 25			1 2	57 -14 40								20		100 100 100 86
MARYLAND * MASSACHUSEITS MICHIGAN MINNESÖTA MISSISSIPPI	26 7 2 29 15	45 58 219 14	38 20 38 16 35	16 12 99 14 38	13 4 17 16 19	15 9 26 6. 27	13 3 5 7 13	4 5 13 1 2	3 2 2 1 1	3 2 30 8 4	3 1 5 9 2	1 5 17 11 13	1 2 3 12 6	35 202 172 36 48	29 69 30 40 24							3				2	67	4	100 100 100 100
MISSOURI MONTANA MEBRASKA NEVADA NEW HAMPSHIRE	33 42 36 48 38	23 14 21 2 11	30 38 34 29 18	16 5 1 1	21 14 2 14 2	3	1 8	1 1 5	1 3 8	1 3 5	1 8 8 7	3 5	8	31 11 24 4	41 30 39 57 73													2	100 100 100
NEM JERSEY. NEW MEXICO NEW YORK NORTH CAROLINA NORTH DAKOTA	27 24 5 4 47	49 93 44 137 5	47 62 11 32 31	21 81 34 1	14 21 8 6	8 2 24 27 1	8 1 6 6	1 3 22 9	1 2 6 2 13	5 3 6 21	5 2 2 5	2 1 9 8	2 1 2 2 6	39 26 205 190 6	38 17 52 45 38					4 4	44 33	•				*. * 1	8	5 7 3	58
OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO	6 13 45 3 50	90 78 6 153	32	80 12 19 1	21 6 4 -17	10 9 5	3 4 1,	10 1 2	† 5 5	32 5	8 2 2	11 16 1 4	3 8 5	152 82 11 252 4	58 57													4	100
RHODE ISLAND SOUTH CAROLINA SOUTH DAKOTA TENNESSEE TEXAS	41 14 40 8 9	9 56 10 88 109		15 12 5 80 36	34 6 10 28 13	10 2 4 32	5 4 1 12	7 9 7 5	3 18 2 2	2 2 8 4	5 1 3 1	5 1 11 4	2 4 1	18 113 23 89 77	46 31			3	60				11			1	11	8	40 100 78
UTAH VERMONT VIRGINIA WASHINGTON WEST VIRGINIA	37 46 22 44 32	24 4 14 3 15	39 25 9 13 19	12 1 35 4	20 6 22 17 11	3 7 3	4	1 1	1	4 7 2	7 4 3	3 3 2 1	5 2 9	14	69 58	- Op.		1	100					*					100
HISCONSIN Hyoning United States	21 ⁻ 31	· 57 39 2496	35 48 30	8 3 1118	5 4 14	13 475	2 16 6	3 B 199	2 10 2	6 4 307	4 5	232	3	81 14 3413	49 17 41	2	1	_13	5	17	7	1				6	2	213	100



Spring 1991, Vol.35, No.2





North Atlantic Hurricanes, 1990

Max Mayfield National Hurricane Center



he 1990 Atlantic hurricane season was an active one. Of the 14 named tropical storms, 8 developed into hurricanes, which compares to the longterm average of 10 named tropical cyclones per year, 6 of which become hurricanes. However, only one 1990 hurricane (Gustav) generated maximum sustained winds greater than 100 knots. Also, many of the 1990 tropical cyclones recurved over the central Atlantic in response to a persistent upper-level trough.

The National Hurricane Center received over 100 ship reports of tropical storm force winds within 300 nautical miles of a storm center. These reports were essential in determining intensity and trends.

The relatively low U.S. damage estimate of \$57 million was the result of only one tropical storm, Marco, hitting the United States. The damage was primarily caused by flooding over Florida, Georgia, South Carolina and North Carolina produced by a combination of the remnants of Marco, the remnants of Klaus and a frontal trough.

Max Mayfield is forecaster at the National Hurricane Center, Miami, Florida. Specific locations and distances (nautical miles) normally refer to the center of the tropical cyclone. It should be noted that tropical cyclones generally cover thousands of square miles around that center and effects can be experienced many miles from it.

Lixion Avila, Bob Case, Hal Gerrish and Miles Lawrence also contributed to this report. Joan David drafted the track chart.

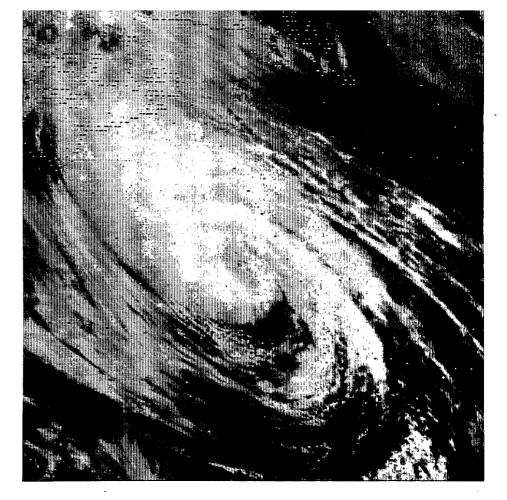
Hurricane Bertha

Bertha originated from a non-tropical area of low pressure near Cape Hatteras, North Carolina. This Low was detected moving southeastward on the 24th of July. By the 25th, the Low began recurving toward Florida. In retrospect, it is estimated that a tropical depression formed about 300 miles east of Daytona Beach, Florida on the 27th. The depression drifted southwestward and made a counterclockwise loop about 250 miles east-northeast of Cape Canaveral, Florida. Based on 35-knot sustained winds reported by the Russian ship Akademik Zavaritsky, the depression was deemed to have reached tropical storm strength early on the 28th.

Air Force reconnaissance reports indicated Bertha reached hurricane strength early on the 29th some 450 nautical miles west southwest of Bermuda. However, strong shearing occurred and Bertha weakened, but then re-intensified again on the 30th,

Although not recommended by the National Hurricane Center, Brad Kennis rides a wave, provided by Hurricane Lili, on the 14th of October (page 16). The scene was the Hot Wax Challenge surfing contest off the Oceanic Pier at Wrightsville Beach, North Carolina. Photograph Courtesy of the Morning Star of Wilmington, NC.

Hurricane Bertha (upper right) is caught by the GOES Satellite in a visible image at 1531 UTC on the 1st of August, south of Nova Scotia.



about 225 nautical miles northwest of Bermuda.

The system accelerated on the 1st of August as the center passed just west of Sable Island. Maximum sustained winds of 70 knots and a minimum central pressure of 973 millibars occurred early on the 2d. Bertha was declared extratropical later in the day with the center directly over Sydney, Nova Scotia. The weakening extratropical system continued northward over the eastern Gulf of St. Lawrence.

For most of its life, Bertha was primarily of concern to the marine community with numerous ships reporting sustained winds in the 35– to 50–knot range. A moored buoy located at 41.1°N, 61.1°W reported 56–knot winds, a significant wave height of 25 feet, and a maximum wave height of 50 feet on the 1st. The broad circulation also produced high surf along the Atlantic coast from North Carolina to Nova Scotia. Moderate beach erosion occurred along the

coast of North Carolina and the Outer Banks. Bertha produced copious amounts of rainfall over Nova Scotia with storm totals in excess of 7 inches at Hunters Mountain and at Braddeck, Nova Scotia.

Nine people perished as a result of Bertha. Thirty-foot waves whipped by 78-knot wind gusts snapped the keel of the 593-foot Greek freighter *Corazon*. Six crewmen perished while trying to abandon ship (see Mariners Weather Log, Winter 1991). A seaman was swept off the 240-foot container ship *Patricia Star* while attempting to secure a deck load in heavy seas. Bertha was also blamed for rip currents that drowned two people at north Florida beaches.

Hurricane Diana

Diana formed from a classical tropical wave which moved off Africa on the 27th of July and represented a typical example of developing disturbances over the Atlantic. The

Monthly Summary of 1990 Atlantic Tropical Cyclones Jul Oct Nov **Total** May Jun Aug Sep **Tropical Depressions** 0 0 0 2 6 1 0 2 **Tropical Storms** 3 0 0 0 1 0 Hurricanes 0 2 2 8 0 1 3 0 5 3 3 1 0 4 0 16 Total

(Tropical cyclones are assigned to the month in which they first became a tropical depression)

wave moved westward through the Windward Islands accompanied by a large area of thunderstorms, but without developing a closed circulation. On the 4th of August, satellite images indicated cyclonic rotation in the low clouds and deep convection covering a large portion of the western Caribbean, suggesting that a tropical depression was forming

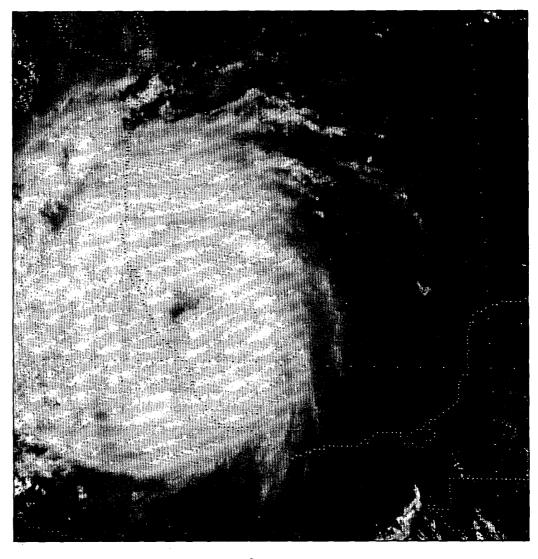
near the eastern tip of Honduras. That was confirmed by limited surface observations and by an Air Force plane, which, indeed, found an incipient 1008-millibar center later that day.

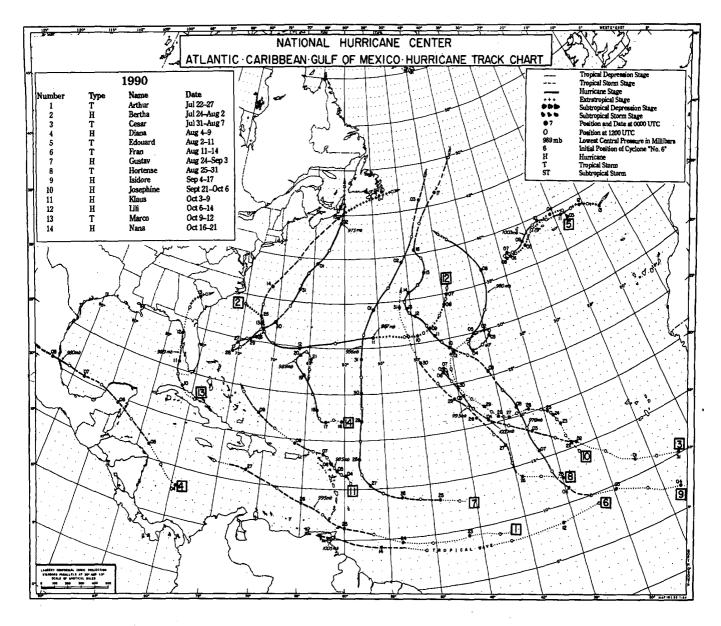
The depression quickly reached tropical storm intensity and crossed the Yucatan Peninsula. Diana strengthened rapidly after

moving away from the Yucatan into the Bay of Campeche. The minimum central pressure was 980 millibars and maximum sustained winds were 85 knots just prior to landfall near Tuxpan, Mexico.

According to an unofficial report from an amateur radio operator, the total number of deaths in Mexico associated with Diana was

This high resolution GOES image was taken as Hurricane Diana approached the Mexican coast at about 1700 UTC on the 7th of August. The hurricane was near its peak intensity when it made landfall near Tuxpan, Mexico, and caused extensive loss of life and damage to the area. The coastal town of Tamiahua was directly hit by the hurricane. Most of the damage was produced by torrential rains which triggered mudslides and flooding.





estimated at 96. The hurricane caused extensive damage to property, agriculture and roads in mountainous areas in the states of Hidalgo and northern Veracruz. The coastal town of Tamiahua was directly hit by the hurricane. Most of the damage was produced by torrential rains which triggered mudslides and flooding.

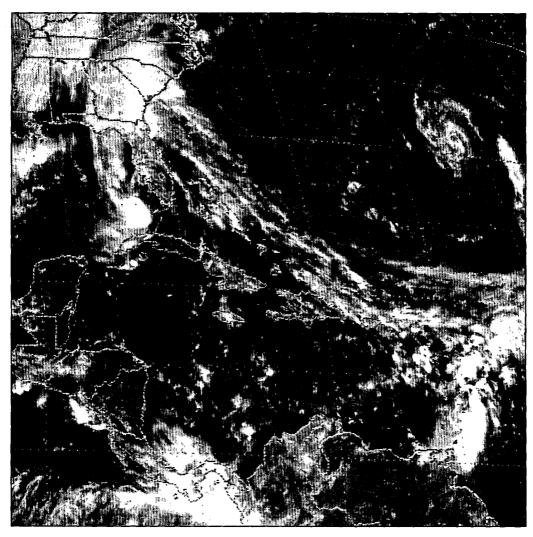
Hurricane Gustav

The tropical wave that spawned Gustav moved off the northwest coast of Africa on the 18th of August, and became embedded within the ITCZ on its westward journey across the tropical Atlantic. It didn't begin strengthening until late on the 23d, and is estimated to have become a tropical depression about 800 nautical miles east of Barbados on the 24th.

Gustav reached tropical storm strength about 600 nautical miles east of Barbados on the 25th. It continued the same general motion under the influence of weak ridging to the north. There was some concern that a cold low to the northwest of Gustav would inhibit development, however, the low had little impact and Gustav reached hurricane strength 240 nautical miles east—northeast of Barbados on the 26th. The first reconnaissance aircraft fix in Gustav had 65—knot winds at the 1500—foot

flight level with 70-knot winds estimated at the surface on the 26th. However the ridge to the north was breaking down and Gustav responded by taking a gradual northwestward and then northward turn, with the center of the system bypassing the Lesser Antilles 180 nautical miles to the east. Aircraft reconnaissance reports indicated that Gustav reached its minimum central pressure of 956 millibars with maximum sustained winds of 105 knots while centered about 400 nautical miles east-southeast of Bermuda.

Late on the 31st, an upper trough west of the system imparted a northeastward motion to Gustav, and on the 1st of September, Gus-



The GOES visible image shows Subtropical Storm Lili over the open Atlantic, while Tropical Storm Marco lurks off the southwest coast of Florida. This photograph was taken at about 1600 on the 10th of October. Marco moved to just a few miles west of Bradenton Beach the following day and continued to hug the coast, with much of its circulation over the St. Petersburg area.

tav began merging and interacting with a frontal zone to the north, which started the weakening process. The *Galion*, a vessel of French registry, appears to have gone through or near the edge of the eye with 70-knot winds reported on the 2d. Gustav accelerated toward the northeast on the 3d, and was declared extratropical on that day. METEOSAT satellite imagery showed that the remnants of Gustav passed less than 200 nautical miles to the south of Iceland.

Hurricane Isidore

Isidore developed from a vigorous tropical wave, which moved off the African coast on the 3d of September. Due to the time of the year and the location, it appeared for a while that the system was going to

be a typical westward-moving Cape Verde hurricane. However, a persistent mid-level trough in the central Atlantic caused the storm to move in a general north-northwest course over open waters.

The wave developed into a tropical depression on the 4th, strengthened steadily to a tropical storm the next day, and to a hurricane on the 7th. Based on satellite estimates, Isidore reached its maximum intensity on the 7th when maximum sustained winds hit 85 knots and minimum central pressure dipped to 978 millibars.

The hurricane encountered strong upper-level winds induced by the same trough which was steering it northward. Due to the strong shearing, Isidore was downgraded to tropical storm status on the 8th. However, an upper low

developed within the trough and moved southward, producing a favorable environment for Isidore to reintensify. An eye developed within a circular mass of convection and once again the system was upgraded to a hurricane, until it moved over cooler waters and weakened several days later. Isidore was absorbed by a large extratropical low on the 17th north of 50°N.

Hurricane Josephine

Josephine originated from a tropical wave, on the 16th of September and became a tropical depression on the 21st. The depression immediately turned northward in response to a deep low over the northeast Atlantic. During the next few days the surface low weakened,

and by the 24th surface high pressure began building to the north of the depression. The depression then turned toward the west and strengthened to a tropical storm. However, a strong upper-level trough produced shearing over the storm on the 25th and Josephine weakened to depression strength by the 26th.

By the 30th, Josephine turned toward the north and northeast into the wake of a weak eastward-moving trough. The trough was too weak to capture the depression, and by the 2d of October it became readily apparent that the next high pressure center, which had moved off the Canadian Maritimes, had begun to block Josephine's escape to the northeast.

Josephine reintensified to tropical storm strength as the high pressure forced the storm into a 360-degree clockwise turn during the following three days.

By the 4th of October, Tropical Storm Josephine, located in a favorable upper-outflow pattern, strengthened to hurricane force. However, the following day, a frontal wave began to form in the trough just to the north of the hurricane. The lowest satellite-estimated pressure of Josephine was 980 millibars with associated winds of 75 knots. On the 6th, Josephine became an extratropical low-pressure center as it continued to move northward of a developing mid-latitude storm. This newly-formed system later developed tropical characteristics and became Hurricane Lili.

Hurricane Klaus

Klaus originated from a tropical wave that moved off the coast of Africa on the 27th of September. The wave moved across the Atlantic for several days, and finally became a tropical depression on October 3 about 100 miles east of Dominica. The system drifted slowly northwestward for 3 days and reached hurricane strength on the 5th. At that time, the center was at its point of closest approach to the Leeward Islands— about 25 nautical miles east of Antigua and, shortly thereafter, about 10 miles east of Barbu-

Tropical Cyclone Winds (Ship encounters of 50 Knots or more)

Tropical Cyclone	Ship Name		Time UTC	Position LatN LonW	Wind(kn) Dir/Speed	Pressure (mb)
Bertha	Pacglory	7/29	1200	30.6 69.0	180/52	1007.2
	Pacglory	7/29	1800	30.1 69.7	180/50	1006.0
	Star Eagle	7/30	1200	32.9 67.3	230/50	996.0
	Star Eagle	7/30	1800	32.7 67.9	270/50	1004.5
	Howell Lykes	7/31	1200	37.7 71.8	320/58	1009.0
Gustav	Trinidad & Tobago	8/27	0000	16.2 56.3	080/63	1007.7
	Galion	9/01	1200	41.3 56.9	070/50	
	Galion	9/02	0000	41.7 53.4	030/70	1014.5
	Budowlany	9/02	1200	37.7 48.6	210/58	
	Galion	9/02	1800	41.8 49.8	280/70	1007.5
	Galion	9/03	0000	41.7 47.9	270/50	1017.0
Isidore	African Highway	9/13	1200	30.6 50.2	240/62	1011.5
Josephin	e <i>Virgo</i>	10/05	1200	30.9 38.2	190/60	1003.2
Lili	Fichtelberg	10/06	1200	35.9 47.9	330/50	1003.0
Nana	Sealift Mediterranean	10/18	1200	23.6 62.5	190/58	1013.0

Klaus reached peak intensity on the 5th with maximum sustained winds of 70 knots and minimum central pressure of 985 millibars. Although Klaus moved close to the Leeward Islands, there were no observations of sustained tropical storm-force winds, due to the frequent shearing conditions that caused most of the deep convection and strong winds to be located north and east of the circulation center.

On the 6th, Klaus weakened to a tropical storm and, by early on the 8th, was north of the Mona Passage when it fell to a tropical depression in response to persistent strong shearing.

Klaus regained deep convection near its center and also tropical storm status later on the 8th. By this time, a secondary low pressure center was noted at mid-atmospheric levels over eastern Cuba. This low drifted westward and gradually worked its way to the surface.

By late on the 9th, Klaus had dissipated and this new low became the dominant feature, which eventually developed into Tropical Storm Marco. The remnants of Klaus, interacting with Marco and a slow-moving frontal trough, were responsible for heavy rainfall across portions of the southeastern United States. Four drowning deaths, related to the remnants of Klaus, were reported from South Carolina when a dam burst and swept away a car and its occupants. In addition, seven deaths, related to the heavy rains associated with Klaus, were confirmed on the Caribbean island of Martinique.

Hurricane Lili

While Hurricane Josephine was moving counter clockwise around a cold low aloft, several hundred miles southwest of the Azores on the 5th of October, the cold low was working its way down to the surface. The Low was classified a subtropical storm on the 6th when ship reports indicated that the strongest winds were well removed from the center. Satellite imagery indicated that the system gradually acquired tropical characteristics during the next few days and became hurricane Lili on the 11th, with a minimum central pressure of 987 millibars and maximum sustained winds of 65 knots. The center passed 120 miles to the south of Bermuda.

On the 13th, Lili weakened to a tropical storm, as the center passed less than 170 miles to the east southeast of Cape Hatteras, North Carolina. Lili accelerated northeastward, and its speed was in excess of 35 knots when the system skirted Nova Scotia as an extratropical storm and passed over the extreme southeastern portion of Newfoundland.

Hurricane Nana

The 14th named system of the season developed from a vigorous tropical wave, which moved over the Cape Verde Islands on the 7th of October. The wave became a tropical depression about 350 miles northeast of Puerto Rico on the 16th.

This depression intensified rapidly and reached hurricane status late on the 17th. Nana attained a minimum central pressure of 989 millibars with maximum sustained winds of 75 knots on the 19th, and posed a brief threat to Bermuda. However, an impulse of upper level westerlies moved across the hurricane and separated the convection from its low level center. Consequently, Nana weakened to a tropical depression and drifted in a southerly direction, steered by the low level flow until it dissipated on the 21st.

1990	Atlantic	Hurricane	Season	Statistics

	No.	Name C	lass 1	Dates 2	Maximum sustained wind (kn.)	Lowest pressure (mb.)	<u>U.S.</u> <u>Death</u> damage (S millions)	<u>\$</u>
1	1.	Arthur	Т	22 – 27 Jul.	60	995		
	2.	Ber tha	Н	24 Jul 2 Aug.	70	973	9	
	3.	Cesar	T	31 Jul 7 Aug.	45	1000		
1	4.	Diana	H	4 – 9 Aug.	85	980	96	
l	5.	Edouard	T	2 - 11 Aug.	40	1003		
l	6.	Fran	T	11 - 14 Aug.	35	1005		
	7.	Gustav	Н	24 Aug 3 Se	p. 105	956		
l	8.	Hortense	T	25 - 31 Aug.	55	993		
	9.	Isidore	Н	4 - 17 Sep.	85	978		
	10.	Josephine	H	21 Sep 6 Oc	t. 75	980		
l	11.	Klaus	Н	3 – 9 Oct.	. 70	985	11	
l	12.	Lili	H	6 – 14 Oct.	65	987		
	13.	Marco	T	9 - 12 Oct.	55	989	57 7	
	14.	Nana	H	16 – 21 Oct.	75	989		
1								

T: tropical storm, wind speed 34 - 63 kn.

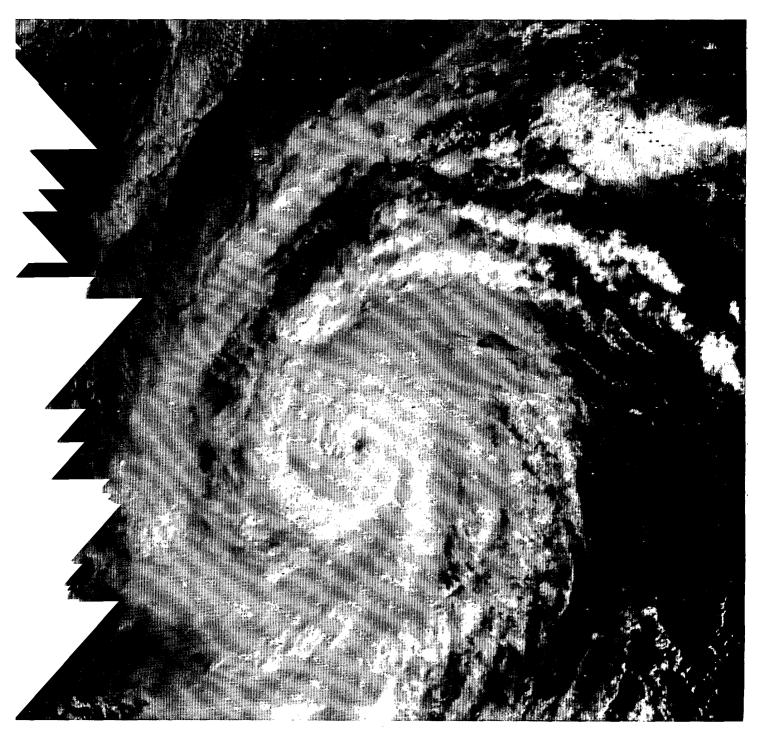
H: hurricane, wind speed 64 kn or higher. Dates begin at 0000 UTC and include tropical depression stage.

Spring 1991, Vol.35, No.2

Eastern North Pacific Hurricanes—1990

Lixion Avila National Hurricane Center

This year featured Hernan and Trudy— among the strongest hurricanes ever observed in this basin, and Alma— the earliest named tropical cyclone of record for the eastern North Pacific.



he Eastern North Pacific produced a record number of hurricanes in 1990, marked by several very strong ones.

The 20 named tropical cyclones were two below the record but four more than the long-term average. Sixteen of those named storms reached hurricane intensity.

Records for this basin are suspect prior to the implementation of weather satellites in 1966. Also, there are generally no direct measures of storm strength in this region. Intensity estimates are derived from empirical relationships based upon cloud characteristics revealed in satellite imagery. These values should not be taken as being precisely correct. Ship reports from merchant and fishing vessels are invaluable.

The origins of all this year's storms and hurricanes were apparently associated with westward moving African waves. With the exception of Marie and Polo, all these systems developed between 5° N and 15° N, east of the longitude of Baja California— their most favored area for cyclogenesis. After their development, eastern Pacific tropical cyclones generally move on a west to northwest track and dissipate over the cooler waters without affecting land. Rachel was the only system to make landfall.

Specific locations and distances (nautical miles) normally refer to the center of the tropical cyclone. It should be noted that tropical cyclones generally cover thousands of square miles around that center and effects can be experienced many miles from it. Bob Case, Hal Gerrish, Miles Lawrence

Lixion Avila is a Hurricane Forecaster at the National Hurricane Center in Miami, Florida. and Max Mayfield also contributed to this report.

Hurricane Alma

Alma, the earliest eastern Pacific hurricane on record, originated from a tropical wave which moved off the African coast on the 29th of April. The wave showed very little convective activity until it moved just to the south of Panama. The system then became better organized and was upgraded to a tropical depression on the 12th of May about 480 nautical miles south of Acapulco, Mexico. The depression developed slowly with maximum sustained winds reaching 75 knots on the 16th. The hurricane then gradually weakened as it moved over cooler waters and into a strong shear environment.

Hurricane Boris

The second tropical depression formed about 350 nautical miles south of Acapulco, Mexico on June 2. It became Tropical Storm Boris about 435 nautical miles southwest of Manzanillo, Mexico on the 4th, and was upgraded to a hurricane the next day, when estimated maximum sustained winds reached 80 knots around a 977-millibar central

pressure. A weakening process began while Boris was moving over increasingly cooler waters. It dissipated a couple of days later.

A 31-foot sailboat named the Azure Dream reported 70-knot winds, a 982-millibar pressure and sails damaged in Boris on the 6th. Moisture from the remnants of Boris spread over the southwestern U.S. and contributed to some locally heavy rains. This was the wettest June for San Diego, California, since records began in 1850.

Hurricane Elida

The origin of this storm can possibly be traced back to a tropical wave that moved from Africa on the 10th of June. However, it was not until the 26th that the system became a tropical depression in the eastern Pacific. It was quickly upgraded to a tropical storm that day and to a hurricane on the 28th, when Elida moved directly over Socorro Island with 70 knot winds and a 990-millibar minimum pressure. A total of 3.7 inches of rainfall was reported there as well as some glass breakage. The Marine Reliance, some 75 nautical miles north northwest of the center, reported 41-knot winds on the 26th. The Dole Ecuador, located a little less than 300 miles east northeast of the center, reported a 37-knot wind on the 27th.

Monthly Summary of 1990 Tropical Cyclones

	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Tropical Depressions	0	1	1	1	1	0	0	4
Tropical Storms	0	2	0	0	1	1	0	4
Hurricanes	1	2	4	3	4	2	0	16
Total (Tropical cyclones are became a tropical dep	assig	ned to		4 month			0 hey fi	24 rst

Hurricane Fausto

A tropical depression formed about 250 nautical miles south southwest of Acapulco, Mexico, on the 6th of July and became Tropical Storm Fausto 1 day later. A weak eye developed and the system was upgraded to a hurricane with estimated 75-knot winds, some 270 miles south of Cabo San Lucas, Mexico. Fausto moved near Socorro Island producing 4 inches of rain, tropical storm force winds and a 996.2-millibar pressure. An unnamed vessel reported winds of 36 knots about 180 nautical miles from the center at 0000 UTC on the 8th. The Nedlloyd van Lindschoten observed southwesterly winds of 35 knots at 0000 UTC on the 9th.

Fausto was downgraded to a tropical storm about 350 nautical miles west of Cabo San Lucas, Mexico.

Hurricane Genevieve

Genevieve was upgraded to a tropical depression on the 11th of July. The depression moved toward the west northwest and gradually strengthened to a tropical storm on the same day. It reached hurricane status on the 13th, while passing very near Socorro Island where a 992.1-millibar pressure and tropical storm force winds were reported prior to equipment failure.

Genevieve reached hurricane strength, with estimated 90 knot winds, and turned toward the northwest by the 16th, moving into an area of strong shear. The hurricane decreased to a weakening tropical storm in 24 hours.

Hurricane Hernan

An African wave moved across Central America on the 15th of July, and organized into a tropical depression about 490 nautical miles southwest of Acapulco, Mexi-

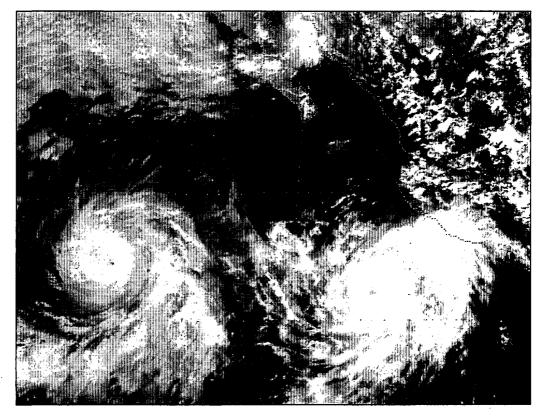
co on the 19th.

Its development was questionable due to the proximity to a trailing depression embedded in a more favorable environment for intensification. Ultimately, both developed. The first became Hernan and the trailing depression became Iselle.

Tropical Storm Hernan reached hurricane status on the 21st and remained in relative close proximity to Iselle for several days. Hurricane Hernan continued strengthening to become one of the strongest hurricanes in recent history in the eastern Pacific. Although no direct measurements were made, highest intensity estimates from satellite imagery were 135 knots with a corresponding minimum central pressure of 928 millibars on the 23d. Those intensity estimates were the same as those made for Hurricane Max (1987), which was credited as being the strongest hurricane of record in the eastern North Pacific to that date.

On the 24th of July, unen-

Hurricane Trudy (page 24) was possibly the most intense hurricane to ever roam the eastern North Pacific Ocean. The photograph was shot at about 1530 UTC on the 19th of October, when winds were estimated at near 135 knots. At right, Hurricanes Hernan and Iselle (right) were caught at about 2000 UTC on the 23d of July. Hernan generated winds estimated at 135 knots. It was, along with Trudy, one of the two strongest storms in the eastern North Pacific records.



hanced infrared satellite imagery revealed a concentric eyewall pattern with one eyewall inside a larger eyewall. Concentric eyewalls have been observed on satellite imagery and radar displays in intense hurricanes in the Atlantic, but they are rare. This is the first time that such a phenomenon has been clearly observed on satellite imagery at the NHC for an eastern North Pacific tropical cyclone.

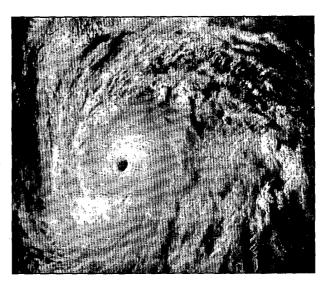
Hernan was a hurricane for slightly over 6 days with estimated winds of 100 knots or higher for 4 days.

Hurricane Iselle

The African wave which produced Iselle became active several hundred miles southeast of Acapulco on the 21st of July resulting in a tropical depression near 10° N, 96°W. In spite of its proximity to Hernan, the depression intensified gradually to storm strength, and reached hurricane status on the 22d. By the 25th, the winds were estimated to be 105 knots with an associated minimum pressure of 958 millibars. Iselle also moved very close to Socorro Island. That island reported a 60 knot sustained wind, a 992.1-millibar pressure, and heavy rain on the 25th.

Hurricane Julio

Julio became a depression on the 17th of August, about 350 nautical miles south of Acapulco, Mexico. It moved west-northwestward to westward from its inception to its demise on the 24th. Julio became a storm on the 18th and a hurricane on the 19th. It is estimated to have reached maximum intensity on the 21st with 100-knot winds and a 960-millibar surface pressure. It weakened to a storm on the 23d and to a depression on the 24th.



Hurricane Marie (left) is near peak intensity in this shot taken at about 0100 UTC on the 11th of September. Marie's winds reached an estimated 125 knots and a ridge to the north kept it on a westerly track. Marie was the only hurricane to move into the central North Pacific this season.

Hurricane Kenna

Kenna originated from the same African wave that spawned Fran over the eastern Caribbean. Fran's remnants were tracked into the eastern Pacific where a tropical depression formed on the 21st of August. The depression, following in the wake of Julio, reached tropical storm status by the 22d and hurricane strength by the 25th, with estimated 980-millibar pressure and 75-knot winds. During the weakening stage, the *Gulf Ideal* observed 35 knots near the center of Kenna at 1800 UTC on the 29th.

Hurricane Lowell

An African wave organized into a tropical depression on the 23d of August. The tropical depression moved west-northwestward and became Tropical Storm Lowell, about 190 miles south southwest of Puerto Vallarta, Mexico, on the 25th. Lowell reached minimal hurricane strength about 250 miles southwest of Cabo San Lucas 2 days later.

As the deep convection weakened, Lowell was downgraded to a tropical storm on the 28th.

Hurricane Marie

On the 7th, a tropical depression formed about 570 nautical miles west southwest of Clarion Island. That location was somewhat west of where tropical cyclones normally form in the eastern Pacific. Marie became a tropical storm on the 8th, and strengthened to its estimated peak intensity of 125 knots on the 11th. A building ridge to the north kept Marie away from cool waters. Consequently, the hurricane moved west of 140° W threatening the Hawaiian Islands. However, the system turned toward the southwest away from those islands and dissipated. Marie was the only hurricane to move into the central Pacific from the eastern Pacific this season. Buoy 5100 located near 17.5°N, 152.9°W reported sustained 35-knot winds on the 18th.

Hurricane Norbert

Norbert began as a tropical depression on the 10th of September, about 660 miles south southwest of Cabo San Lucas, Mexico. The system reached tropical storm status later on the same day, but remained poorly organized until the 12th, when the storm interacted with Tropical Depression Eighteen–E. A classical Fujiwara interac-

tion occurred when the two systems were located only about 140 nautical miles apart, with the two centers rotating around each other. Finally, the depression was absorbed by Norbert, which then strengthened.

Norbert became a minimal hurricane on the 14th, and developed an eye for a short period of time on the 15th. The maximum wind of 48 knots was observed by an unnamed ship, about 60 nautical miles from the storm's center at 0600 UTC on the 11th. Norbert weakened to a tropical depression and then dissipated on the 19th over cool waters.

Hurricane Odile

Odile was first tracked in the eastern Pacific Ocean as an area of disturbed weather triggered by an African wave located several hundred miles south of Acapulco, Mexico. It became a tropical depression on the 23d of September, reached tropical storm strength on the 24th, and became a hurricane on the 25th. The next day it is estimated to have reached its peak intensity with 125-knot sustained winds and a 935-millibar central pressure.

Odile maintained 125-knot winds for 24 hours and then began to weaken, while gradually turning more northwestward in response to a slight weakness in the high pressure ridge. By the 28th, the hurricane was over cool waters and weakneed as rapidly as it had earlier intensified.

Hurricane Polo

The southern portion of a convectively-active African wave which triggered Isidore in the Atlantic, continued its trek across the Caribbean and showed signs of development over the Bay of Campeche. An Air Force recon-

naissance aircraft flying into the system could not locate a circulation center but an area of strong deep convection moved onshore along the Mexican coast and then moved westward for the following week.

After several diurnal convective outbursts, the system organized into a tropical depression near 140°W on the 28th of September and rapidly intensified into a minimal hurricane. Once Polo reached hurricane status it was destroyed quickly by strong wind shear in the vertical.

Hurricane Trudy

Trudy was a hurricane for 11 days while traveling a little more than 1200 nautical miles over the eastern Pacific. The tropical wave that became Trudy could be identified as early as the 30th of September, near the African coast. However, the wave did not show signs of

Tropical Cyclone Winds (Ship encounters of 35 knots or more)					
Ship Name	Date Mo/Da	Time UTC	Position LatN LonW	Wind (kn) Dir/Speed	Pressure (mb)
Azure Dream	6/6	0900	20.0 115.0	070/70	982.0
Hansa Bremen	6/20	1800	17.1 103.6	070/44	
Marine Reliance Dole Ecuado	6/26 6/27	2200 2300	17.1 107.0 19.2 105.3	080/41 120/37	1003.0 1010.5
Unnamed Nedlloyd van Lindschoten	7/8 7/9	0000 0000	20.0 106.0 16.5 106.8	130/36 230/35	1008.0 1007.5
Gulf Ideal	8/29	1800	21.9 135.2	070/35	1013.5
Unnamed Unnamed Sugar Islander	9/11 9/11 9/11	0600 1200 1800	11.9 111.4 11.9 112.5 12.0 114.0	260/48 250/37 230/35	1009.0 1006.5 1010.5
Makhtoum-Kouli Maple Ace Maple Ace ELDY	10/18 10/18 10/19 10/25	0600 1800 1800 0000	11.4 104.3 12.0 105.0 10.0 110.0 16.0 117.0	250/35 220/45 225/40 290/35	1008.6 1005.0 1002.0
	Ship Name Azure Dream Hansa Bremen Marine Reliance Dole Ecuado Unnamed Nedlloyd van Lindschoten Gulf Ideal Unnamed Unnamed Sugar Islander Makhtoum-Kouli Maple Ace Maple Ace	Ship Date Mo/Da Azure Dream 6/6 Hansa Bremen 6/20 Marine Reliance 6/26 Dole Ecuado 6/27 Unnamed 7/8 Nedlloyd van Lindschoten 7/9 Gulf Ideal 8/29 Unnamed 9/11 Unnamed 9/11 Sugar Islander 9/11 Makhtoum-Kouli 10/18 Maple Ace 10/18 Maple Ace 10/19	Ship Date Time Mo/Da UTC	Ship Date Time Position LatN LonW	Ship Date Time Position Wind (kn) Name Mo/Da UTC LatN LonW Dir/Speed

development until the 16th of October, when a tropical depression formed several hundred miles south of Acapulco, Mexico.

The depression developed rapidly and in less than 36 hours Trudy was a powerful hurricane with 135-knot winds and a 925-millibar minimum pressure, according to satellite estimates. Trudy was at least as intense as Hurricane Max of 1987 and Hurricane Hernan of this season. Trudy may have been the strongest eastern Pacific hurricane since wind estimates have been available from satellite images.

An upper level trough located to the north forced Trudy to drift northward for a couple of days, increasing the risk of hurricane conditions to residents of Baja California. This same trough created an unfavorable environment, which weakened the hurricane considerably. As the trough was replaced by a ridge, Trudy resumed a westward motion and reintensified, developing an unusually large eye of nearly 50 nautical miles in diameter.

Another deep trough approached and pulled the hurricane northward, shearing it at the same time. Trudy dissipated on the 1st of November but the middle-level moisture was advected northeastward over northern Mexico and the southwestern United States.

Socorro Island reported hurricane force winds for more than 7 hours. The winds on that island reached 105 knots with gusts to 115 knots and a surface pressure of 995.3 millibars. These reports were received via ham radio and apparently were confirmed. However, these winds occurred when satellite wind estimates were only 70 knots and the hurricane was located about 80 miles south southwest of Socorro, so their authenticity remains somewhat in doubt. The Maple Ace reported 45 knots about 75 miles from the center at 1800

UTC on the 18th. Two other ships, *Makhtoum-Kouli* and ELDY reported tropical storm force winds.

Hurricane Vance

A tropical depression formed about 350 nautical miles south southeast of Acapulco. The depression paralleled the west coast of Mexico from the 21st through the 26th. It became a tropical storm on the 23d and a hurricane on the 25th. Vance peaked on the 26th with maximum sustained winds estimated at 85

knots and a minimum central pressure estimated at 975 millibars.

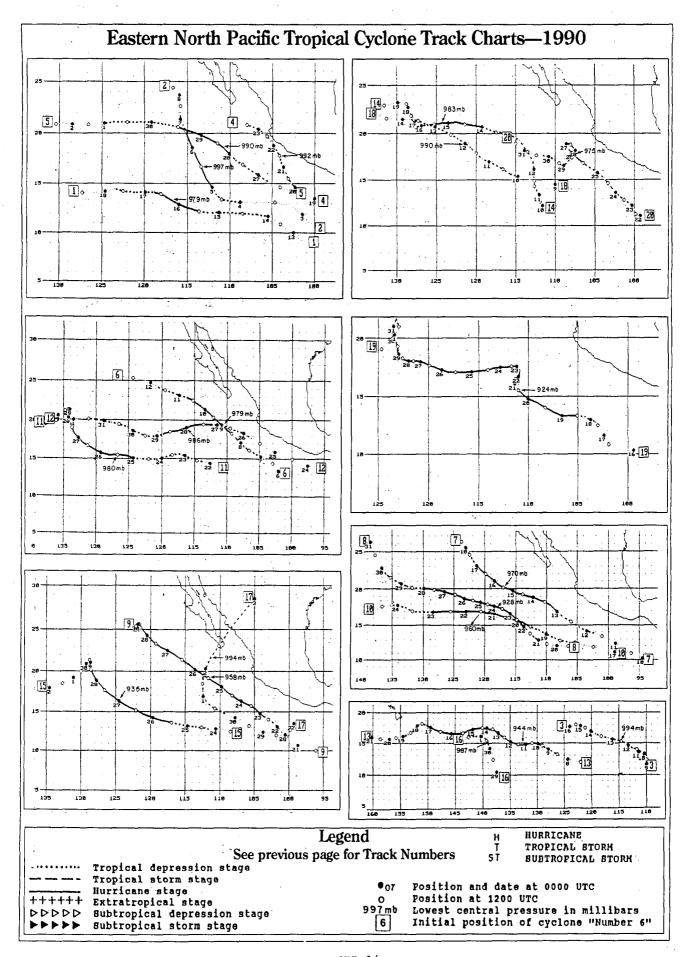
Vance was centered only 250 nautical miles south of the southern tip of the Baja peninsula when a ridge of high pressure blocked its forward motion and the center moved in a small loop for two days. Vance began to weaken on the 27th as a result of strong shearing conditions and also probably by being located over waters that were cooled by upwelling caused by Trudy a few days earlier, and by Vance itself. It dissipated late on the 31st.

	•	
	, .	

1990 Eastern North Pacific Named Tropical Cyclones

No.	Name	Class			n Lowest I press.	U.S. Deaths damage
	-	<u> </u>	wi	ind (knot	s) (mb) (s	Smillions)
1	Alma	Н	12 – 18May	75	979	
2	Boris	Н	2 – 8 Jun	80	977	
3	Cristina	T	8 – 16 Jun	55	994	er as
4	Douglas	T	19 – 23 Jun	55	992	
5	Elida	Н	26 Jun - 2 Jul		990	
6	Fausto	Н	6 – 12 Jul	90	979	
7	Genevieve	H	10 – 18 Jul	90	970	
8	Hernan	H	19 – 31 Jul	135	928	
9	Iselle	Н	20 - 30 Jul	105	958	
10	Julio	H	17 – 24 Aug	100	960	
11 .	Kenna	Η.	21 - 30 Aug	75	980	
12	Lowell	Н	23 Aug - 1 Se	p 65	986	
13	Marie	H	7 – 21 Sep	120	944	
14	Norbert	Н	10 - 19 Sep	70	983	
15	Odile	H	23 Sep - 2 Oc	t 125	935	
16	Polo	Н	28 Sep - 1 Oct	t 65	987	
17	Rachel,	T	27 Sep - 3 Oct	t 55	994	
18	Simon	T	9 – 14 Oct	60	990	
19	Trudy	Н	16 Oct - 1 No	v 135	924	
20	Vance	Н	21 - 31 Oct	85	975	

- ¹ T: tropical storm, wind speed 39–73 knots.
- H: hurricane, wind speed 64 knots or higher.
- ² Dates begin at 0000 UTC and include tropical depression stage.



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Typhoons of the Western North Pacific, 1990

Staff, Joint Typhoon Warning Center

or the western North Pacific, calendar year 1990 became the busiest in JTWC's history—794 warnings were issued on 32 tropical cyclones. This was slightly more than the climatological mean of 31 tropical cyclones.

While 1990 was near a average year in total tropical cyclones, it was above average for the number of typhoons (17) and super typhoons (4). All the tropical cyclones formed in the monsoon, or near-equatorial trough, even though the Tropical Upper-Tropospheric Trough (TUTT) was much in evidence during the summer. A TUTT is a dominant climatological system and a daily upper-level synoptic feature during the summer season over the tropical North Atlantic, North Pacific and South Pacific Oceans.

January - May

The first tropical cyclone of 1990 in the western North Pacific, Koryn, (01W), also became the third typhoon to occur in January in the past 11 years. Unlike

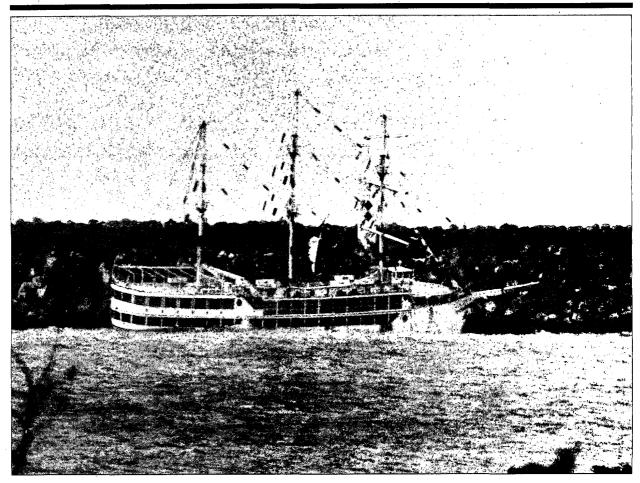
Typhoon Jack (1988), which came to an abrupt halt and rapidly dissipated just east of Guam, this typhoon turned northward and tracked through the Mariana Islands. Koryn brought the strongest sustained winds to the Marianas since Roy (1988), another January typhoon. Maximum winds reported at Andersen Air Force Base, Guam were 40 knots gusting to 55 knots, while Naval Air Station Agana reported 54 knots with gusts to 70 knots.

After a three month lull, Lewis (02W) developed 200 nautical miles south of Chuuk Island and moved northward, passing directly over the island. After continuing its northward trek for 4 more days, it was sheared apart by a digging mid-latitude trough, and the low-level remnants of the tropical cyclone drifted west-northwestward for several more days before completely dissipating.

Marian (03W) followed and persisted in low latitudes for almost a week before intensifying to become the second typhoon of 1990 and the only significant tropical cyclone to form in May. It tracked from the Philippine Sea across the Philippine Islands and into the South China Sea, where it recurved and merged with a frontal system to form an extratropical low.

June

Following a 1-month break in tropical cyclone activity, Tropical Depression 04W, became the first significant tropical cyclone to form in the South China Sea this year. Because satellite and synoptic fix positions disagreed throughout the depression's life, it proved to be very difficult to locate and forecast. As Tropical Storm Nathan (05W) was crossing into the South China Sea, Tropical Depression 04W was drawn into the larger circulation and absorbed. Nathan, then executed an abrupt track change and stalled before moving off to the north. Both the track and intensity of TD04W and Nathan were dominated by a larger monsoon circulation in the South China Sea. In Hong Kong, according to the Monthly Weather Summary June 1990



PH1 Jon Hockersmith

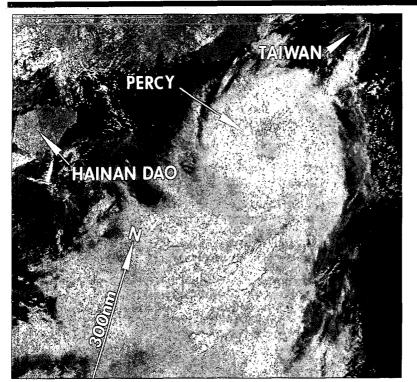
The dinner cruise ship Courageous was driven aground on the Glass breakwater in Apra Harbor, Guam, during Typhoon Russ. Photo courtesy of COMNAVMAR Public Affairs/PH1 Jon Hockersmith. This December typhoon was the last of the season and the most severe to strike Guam in 14 years. Damage was estimated as high as \$120 million. The island was declared a national disaster area by President Bush on December 24th. Miraculously, no fatalities occurred and only minor injuries were reported. Credit for this was given to disaster preparedness agencies and the communications media. At sea, however, one crewman was lost from a Japanese fishing vessel that foundered southeast of Guam and 10 crew members from a South Korean fishing vessel were lost at sea after their 65-foot boat apparently broke down south of Guam, directly in the typhoon's path. Also, a 220-foot fishing vessel went aground on the breakwater in Apra Harbor.

published by the Royal Observatory, 13 people were killed, 5 missing and another 15 injured as a result of Nathan. The cargo ship *Tien Fu* sank in the South China Sea on the 16th, with the loss of the Captain and three of its crew. Two men were reported missing in Macao after being swept overboard from a dredger on the 17th.

Ofelia (06W) became the third typhoon of 1990 and the first for the month of June. It moved toward the Philippine Islands, then slowed and turned to the northwest. It was the second tropical

cyclone of the year to strike Taiwan and the first to affect the east coast of China. After recurvature, the extratropical remnants of Ofelia crossed Korea, unusual for a June system. **Percy** (07W) followed as the fourth and last tropical cyclone in June. After forming southeast of Guam, it turned on an unusual trek toward the southwest for 36 hours before paralleling Ofelia's (06W) west-northwestward move around the western periphery of the subtropical ridge. Percy damaged several islands in the western Carolines. The first of these was Sorol,

an atoll located 150 nautical miles southeast of Yap. As the tropical storm passed 40 nautical miles to the south of Sorol, the second largest island in the lagoon, Pegelmol, was almost cut in half and another island lost one third of its area due to wave action. In addition, Yap suffered extensive flooding along its eastern shore. Nugulu, 60 nautical miles to the south southwest of Yap took the brunt of the storm, with maximum gusts estimated at 70 knots and all crops totally destroyed. One death was attributed to Percy as the storm



U.S. Navy

The ragged, cloud-filled eye of Typhoon Percy (above) at 0100 UTC on the 28th of June reformed after its collision with northern Luzon. Percy was the second storm in less than a week to devastate northern Luzon. The resulting landslides left 8 people dead and more than 31,000 homeless, adding to the misery left behind by Ofelia.

passed Palau. Once past the Carolines **Percy** became the second typhoon within a week to batter northern Luzon before recurving over eastern China.

July - October

The first significant tropical cyclone of July, Robyn (08W), followed what at first glance might appear to be a typical recurvature path. However, Robyn's motion was actually a classic example of the response of a tropical cyclone to the establishment of an omega block in the westerlies to the north, and thus was significant as a case study of an infrequent, but complex, synoptic influence on tropical cyclone motion. The monsoon trough activity substantially increased and Steve (09W) along with Tropical Storm Tasha (10W) and Typhoon Vernon (11W) combined into the only three storm

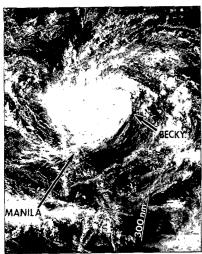
tropical cyclone outbreak to occur in the northwest Pacific this year.

Steve persisted on an atypical northeastward track throughout its existence. Tasha (10W), the third of four western Pacific tropical cyclones to occur in July, developed in the monsoon trough, but instead of following Steve (09W) and Vernon (11W) to the northeast, it made only a brief start in that direction before curving to the west and entering the South China Sea. After erratic motion and slow intensification, Tasha finally reached tropical storm intensity before slamming into the southern coast of China, about 75 nautical miles east of Hong Kong on the 31st of July. It caused widespread damage due to torrential rains and flooding in Fujian and Guangdong provinces, where 108 people lost their lives. Vernon (11W) followed Steve's northward-oriented track,

as the monsoon trough underwent a major displacement to the north.

As the first typhoon of 1990 to hit Japan, Winona (12W) was the only tropical cyclone to form poleward of 25°N this year. It developed in August from the remnants of Tropical Storm Tasha (10W) in a monsoon trough that was displaced northward of its normal location. Winona had an unusual track to the southeast before it turned northward to cross the southern portion of the Kanto Plain. In the central Pacific, Aka (01C) developed and remained embedded in the trade wind trough. It tracked steadily west-northwestward and never developed beyond tropical storm intensity. Aka was the only tropical cyclone of 1990 to be in warning status when it crossed the dateline from the Central into the Western Pacific Ocean.

As Aka was dissipating, Yancy (13W) generated in the monsoon trough. It became JTWC's best forecast tropical cyclone of the year, and although the track was generally toward the northwest, it contained several interesting features, including interaction with a strengthening subtropical ridge, the effects of a passing mid-latitude shortwave trough and land interaction with the mountainous terrain of Taiwan. Yancy triggered a deep monsoonal surge that resulted in heavy rains and flooding in northern Luzon, leaving at least six people dead. In China the storm was responsible for at least 216 deaths. In the wake of Typhoon Yancy (13W), a surge in the southwesterly monsoon flow developed and Zola (14W) formed west of Guam in the monsoon trough. The depression initially tracked northeastward in response to a monsoon surge and slowly intensified. Zola then broke away from the monsoon trough and



IS Nav

Becky (above) reaches minimum typhoon intensity just as it hits northern Luzon at 0039 UTC on the 26th of August. Once again northern Luzon suffered from torrential rains and flooding. Becky was responsible for 32 deaths in Luzon. Later, off Vietnam, three boats and a total of 20 fishermen were reported missing.

intensified to a typhoon. The typhoon recurved over western Honshu, moved into the Sea of Japan and accelerated east-north-eastward.

Typhoon Abe (15W), the fourth of five tropical cyclones in August, caused extensive damage from the Republic of the Philippines to northern China during its 9-day life. At least 12 people died in Manila and landslides from heavy rains resulted in 32 deaths in the provinces north of Manila. Flooding in Taiwan cost one life while 51 people died in mainland China, near Shanghai. Abe was also noteworthy as a classic example of the erratic motion and rapid reorganization that can occur in association with an intense monsoon surge. Becky (16W), a midget typhoon and the eleventh typhoon of 1990, generated in the monsoon trough and tracked south of the subtropical ridge throughout its existence. After initially moving west-northwestward, the storm took a southwestward track across

the northwestern tip of Luzon before heading westward across the South China Sea. **Becky** hit northern Luzon with typhoon-force winds and later slammed into northern Vietnam as a severe tropical storm.

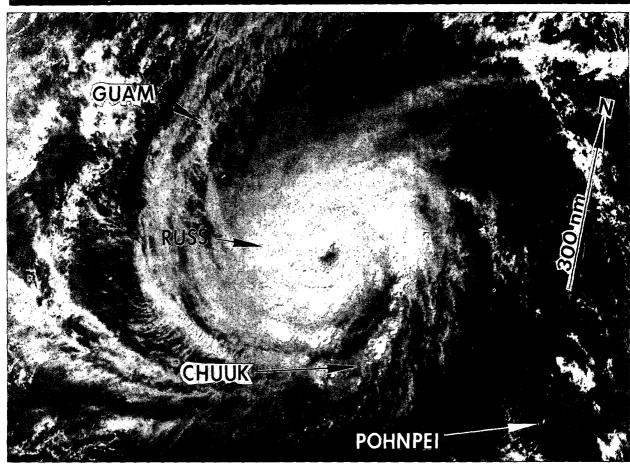
Dot (17W) developed in the monsoon trough at the same time as Tropical Storm Cecil (18W) and brought enhanced southwesterly wind flow and heavy rains across Guam. Later, as Dot crossed central Taiwan, torrential monsoon rains from the associated monsoon surge caused extensive flooding in northern Luzon. During its passage across Taiwan and the Fujian Province of China, surface winds in the Formosa Strait exceeded 50 knots for 30 hours. Tropical Storm Cecil (18W) was a short-lived, midget tropical cyclone that formed in the wake of Typhoon Abe (15W). As Abe raced poleward, the monsoon trough reestablished itself over northern Luzon, and Cecil formed at the northeast end of the trough. Cecil tracked northward and skirted the northern coast of Taiwan before making landfall in southeastern China. Ed (19W) formed in the Marshall Islands and continued westward for nearly 2 weeks before finally making landfall in northern Vietnam. It was the third of six tropical cyclones to form in September. Flo (20W) was the first of four super typhoons this year, and the object of over 3 consecutive days of upper-tropospheric aircraft reconnaissance missions during the TCM-90 field experiment. Flo formed in the wake of Typhoon Ed (19W), passed close to Guam, then rapidly intensified into a super typhoon as it approached Okinawa. It recurved slowly before accelerating northeastward towards the Japanese mainland where it was called the most powerful typhoon to hit Honshu in 19 years. At least

38 people were reported dead or missing, and damage was estimated in the millions of dollars. Transportation, communications and power were also disrupted.

Gene (21W) was the fifth significant September tropical cyclone and the fifteenth of the year to reach typhoon intensity. The initial disturbance formed 250 nautical miles west-southwest of Guam and tracked westward for three days before turning northwestward. Gene followed a classic recurvature pattern, passing west of Okinawa and skirting southern Japan. As Gene moved along the southern coastlines of Kyushu and Honshu, it caused four deaths and local flooding. Winds of 70 knots were measured on Kyushu.

Hattie (22W), the last of six tropical cyclones to form in September, was the fourth tropical cyclone in a 6-week period to affect Okinawa and southern Japan. It also followed a classic recurvature track. As Hattie passed 30 nautical miles west of Okinawa, it caused damage in excess of \$1.7 million to U.S. military bases. Maximum gusts up to 75 knots were recorded on Okinawa. On a positive note, rainfall from Flo, Gene and Hattie provided 15 to 20 inches of water to fill up almost empty reservoirs.

Ira (23W) was the eighth tropical cyclone to hit Vietnam in 1990 and the last in a series of weak, highly sheared tropical systems in the South China Sea. It formed in a broad area of convection near Palawan Island. The convective cloud mass tracked steadily westward in the deep easterly flow and made landfall at Qui Nhon, Vietnam on the 3d of October. According to the United Press International, the typhoon damaged 110,000 houses and killed seven people in the coastal provinces of Vietnam.



U.S. Navy

Super Typhoon Russ (above) at 2307 UTC on the 18th of December is near peak intensity after the passage of a mid-latitude short wave trough enhanced its outflow aloft. For Guam, Russ was a relatively dry typhoon because the eye wall with its torrential rains passed just to the south. However an estimated \$20 million in damage was done to civilian housing and \$5 million to the infrastructure. The Port Authority of Guam reported over \$100,000 damage to port service equipment, while private businesses estimated damage at \$31 million. Military losses were estimated at over \$6.5 million.

Jeana (24W), the second of four tropical cyclones to form in October, was the fifth to churn across the South China Sea in 1990. It was difficult to forecast the intensity and track of this minimal tropical storm. Kyle (25W) generated from a disturbance in the monsoon trough 600 nautical miles east of Guam. Separating from the trough, the cloud system gained organization and began to track along the southern edge of the subtropical ridge to its northeast. The subtropical ridge and a series of fast moving mid-latitude, short-wave troughs strongly influenced Kyle's track. The tropical cyclone passed through the northern Mariana Islands, causing minimal damage, intensified into a typhoon, and recurved. **Lola** (26W), the last of four October tropical cyclones, formed in the South China Sea. It tracked westward along the same path taken by Tropical Storm **Jeana** (24W) 4 days earlier.

November - December

Mike (27W), one of the most intense and destructive tropical cyclones of 1990, caused havoc in the western Carolines and in the central Philippines. Although basically a west-northwestward straight runner, it posed numerous forecast challenges due to frequent direc-

tion, speed and intensity changes. As a result of the devastation and death in the Republic of the Philippines, Super Typhoon Mike's name was retired from the ITWC list of tropical cyclone names. Super Typhoon Mike was the most powerful typhoon to strike the Philippines this year and was reported to be the worst to hit the country since 1981. In the central Philippines at least 250 people were reported dead or missing, while over 37,000 houses were destroyed. Cebu City, the commercial and transportation capital of the region, was severely damaged and more than 57 water craft, mostly in the port of Cebu, sank.

On Koror, 45 nautical miles south of Mike's center, extensive damage occurred to boats, greenhouses, aquiculture projects, fruit trees and vegetable gardens. The National Weather Service Office at Koror recorded maximum wind gusts of 72 knots, a minimum sea level pressure of 980.5 millibars and 9.8 inches of rain. Closer to Mike's center, where maximum wind gusts of 135 to 165 knots were estimated, Kayangel Island was almost totally devastated. Many people there lost everything.

Nell (28W), the second of four November tropical cyclones, intensified in the South China Sea and tracked westward, making landfall in Vietnam. Page (29W) was the third November storm, the second super typhoon of the month, and part of the three-storm outbreak which included a pair of tropical cyclones near the dateline: Owen (30W) in the northern hemisphere and Sina (TC 03P) in the southern hemisphere. Persisting as a discrete disturbance for nearly 2 weeks before the first warning was issued, Page took only three days to intensify to 140 knots once development commenced.

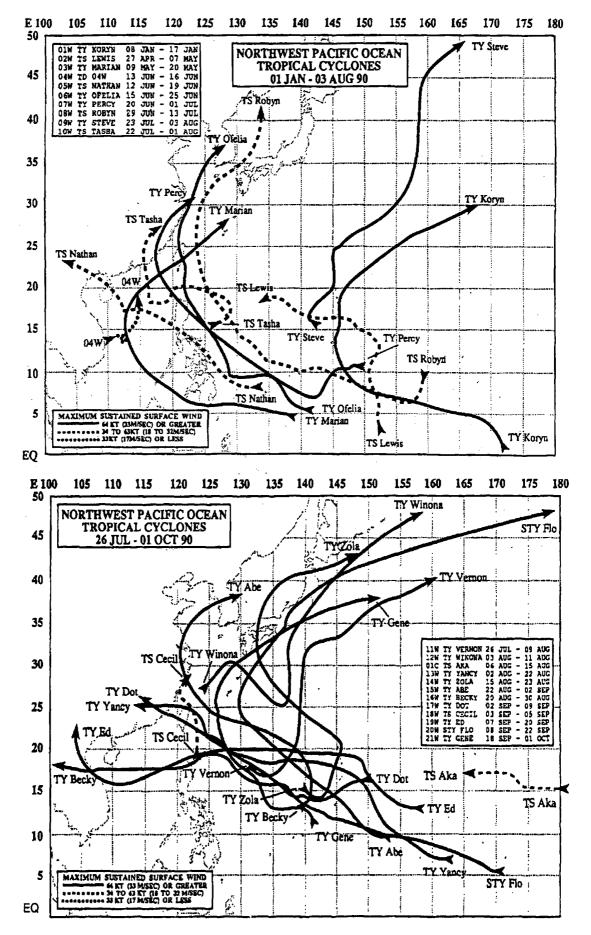
Owen (30W) was both the longest lasting and one of the most interesting tropical cyclones of 1990. It started to rapidly intensify while still a tropical depression, explosively deepened to super typhoon intensity, weakened and then reintensified to a super typhoon. Owen started as a discrete cloud mass southwest of Hawaii, maintained its integrity as it tracked westward in the trade wind trough, but did not intensify until it crossed the dateline and passed north of Kwajalein in the Marshall Islands. It then reached typhoon intensity in less than 18 hours and continued westward

over the central Caroline Islands until its deep convection was sheared away southeast of Ulithi Island in the western Carolines. The exposed low-level remained organized for 6 more days as it moved north, then west, and finally southwestward before dissipating over the Celebes Sea after crossing Mindanao. Owen wreaked havoc in the central Caroline Islands. Several atolls were virtually stripped of houses and crops. In Pohnpei two people were killed by a live power line when it fell. Chuuk State was declared a U.S. federal disaster area and on Pulap Atoll 99 percent of the houses were destroyed. Several locations reported winds in excess of 85

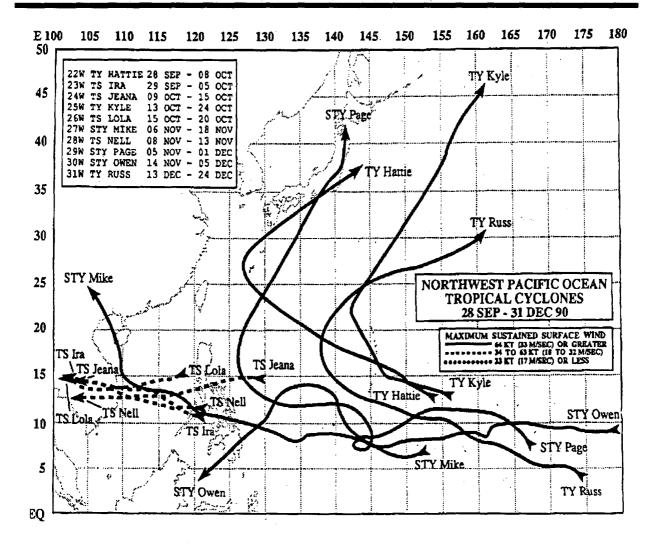
knots.

Russ (31W), the last western North Pacific tropical cyclone of 1990, was the most severe to strike Guam in 14 years. Damage was estimated as high as \$120 million. Russ formed in the Marshall Islands, tracked west-northwestward and intensified to near super typhoon intensity as it approached Guam. The typhoon passed within 30 nautical miles of the southern tip of Guam and brought typhoon force winds, which caused extensive damage, especially to the southern portion of the island. After leaving Guam, Russ slowly weakened, recurved and became an extratropical cyclone.

TROPICAL CYCLONE	PERIOD OF WARNING	WINDS KT(M/SEC)	ESTIMATED MSLP(MB)
(OlW) TY Koryn	12 Jan - 17 Jan	75(39)	967
02W) TS Lewis	29 Apr - 03 May	35(18)	997
(03W) TY Marian	15 May - 19 May	90(46)	954
(04W) TD 04W	14 Jun - 15Jun	30(15)	1000
(05W) TS Nathan	15 Jun - 19 Jun	55(28)	984
06W) TY Ofelia	17 Jun - 25Jun	90(46)	954
(07W) TY Percy	21 Jun - 30 Jun	115(59)	927
08W) TS Robyn	07 Jul - 11 Jul	45(23)	991
O9W) TY Steve	25 Jul - 02 Aug	115(59)	927
IOW) TS Tasha	28 Jul - 31 Jul	55(28)	984
11W) TY Vernon	29 Jul - 07 Aug	95(49)	948
12W) TY Winona	06 Aug - 11 Aug	65(33)	976
01C) TS Aka*	07 Aug - 15 Aug	45(23)	991
13W) TY Yancy	13 Aug - 21 Aug	90(46)	954
14W) TY Zola	17 Aug - 23 Aug	100(51)	944
15W) TY Abe	24 Aug - 01 Sep	90(46)	954
16W) TY Becky	24 Aug - 30 Aug	70(36)	972
17W) TY Dot	03 Sep - 09 Sep	80(41)	963
18W) TS Cecil	04 Sep - 05 Sep	45(23)	991
19W) TY Ed	10 Sep - 20 Sep	90(46)	954
20W) STY Flo	12 Sep - 20 Sep	145(75)	891*
21W) TY Gene	23 Sep - 30 Sep	80(41)	963
22W) TY Hattie	30 Sep - 08 Oct	90(46)	954
23W) TS Ira	02 Oct - 03 Oct	35(18)	997
24W) TS Jeana	13 Oct - 15 Oct	35(18)	997
25W) TY Kyle	16 Oct - 22 Oct	90(46)	954
26W) TS Lola	17 Oct - 18 Oct	40(21)	994
27W) STY Mike	07 Nov - 18 Nov	150(77)	885
28W) TS Nell	10 Nov - 12 Nov	59(26)	987
29W) STY Page	19 Nov - 30 Nov	140(72)	898
30W) STY Owen	21 Nov - 03 Dec	140(72)	898
31W) TY Russ	14 Dec - 24 Dec	125(64)	916



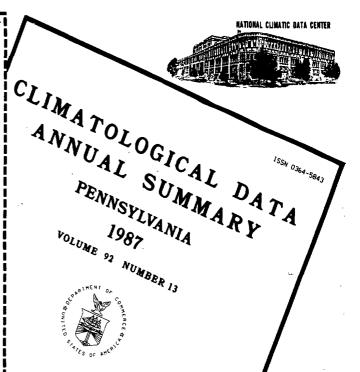
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- Average temperatures and departures from normal.
- Temperature extremes and freeze data.
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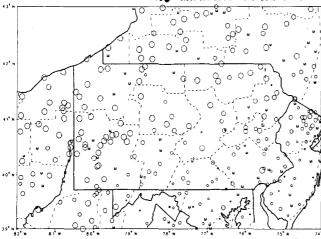
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INCOMPLETE DATA FOR THE MONTH

EXACTLY NORMAL
5,10,20; . 50% OR MORE BELOW NORMAL
10,20,40....100% OR MORE ABOVE NORMAL



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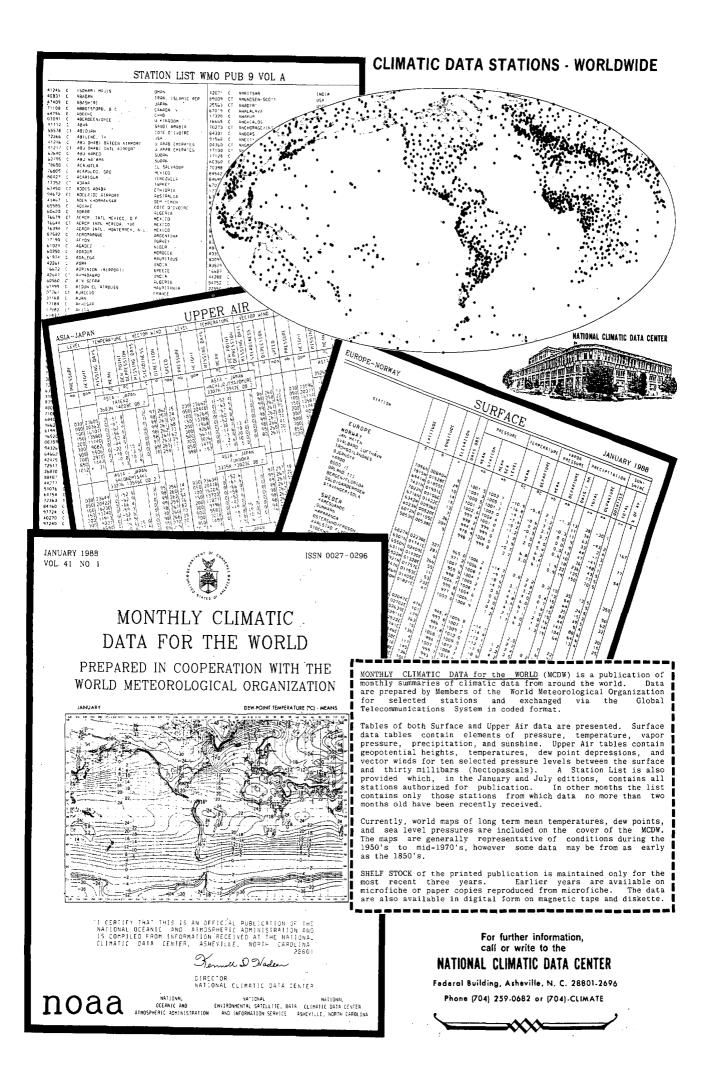
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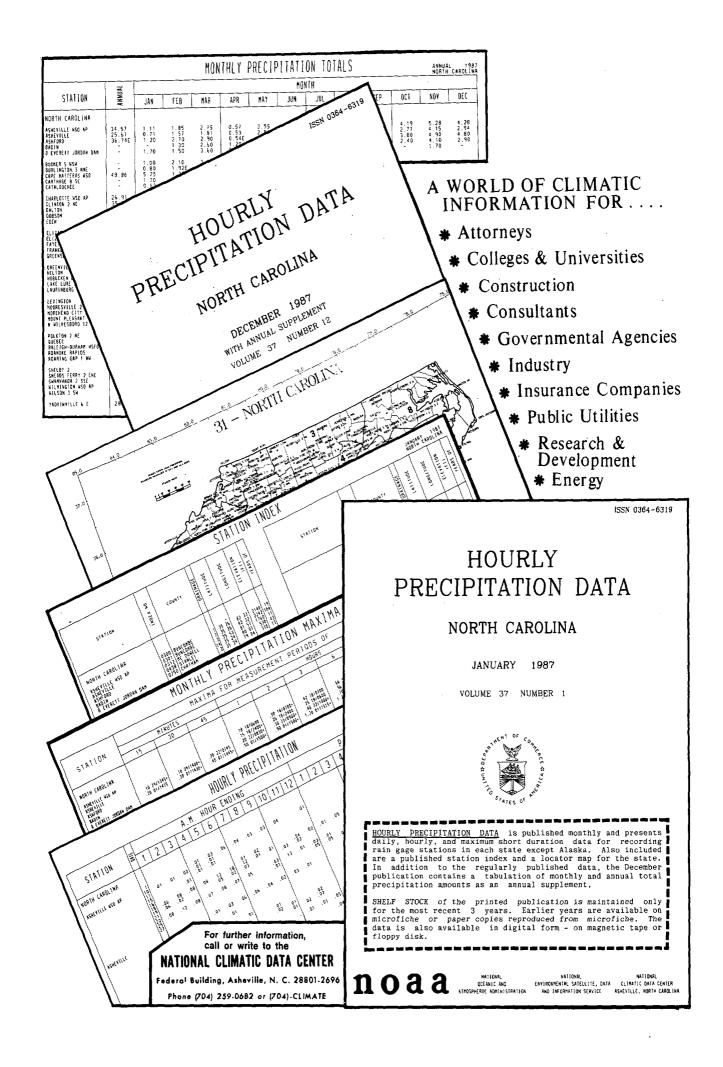
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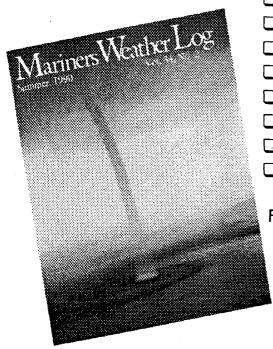
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